Chapter 3: Affected Environment — Human Activities in Antarctica

Chapter 3. Affected Environment — Human Activities in Antarctica

3.1. Introduction

Climate limits the presence and activities of humans in Antarctica. The persistence of cold even during the summer season, limited precipitation with desert-like conditions over much of the continent, frequent overcast skies, severe winds, and the succession of storms mainly in summer over the ocean and coastal areas combine to curtail human activities (Beltramino 1993).

Visibility over the continent can be very good due to low humidity and the pureness of the air, but can be reduced to zero by blowing snow or blizzards. In coastal areas, blizzards occur, fog curtails activities, and whiteouts[1] pose a serious risk for the movement of persons, terrestrial vehicles and aircraft as orientation in any direction becomes nearly impossible. The ice cover and its surface relief can impose difficulties for surface transportation and occasionally for air transport, with conditions aggravated by snowdrifts and possibly poor or no visibility. Other risks faced by humans include: frostbite, snowblindness, lethargy and death due to hypothermia, injury or death due to a fall into a crevasse, and drowning from breaking through sea-ice (Beltramino 1993).

The ice at sea presents risks to navigation. Accessibility to Antarctica by sea and anchorage on the coast are made difficult by the varying conditions of the sea ice and the rocky coastline. Better access can be found at islands west and north of the Peninsula, the western side of the Peninsula, and Victoria Land on the Ross Sea, but even at these locations good anchorage sites are uncommon (Beltramino 1993).

Antarctica is the only continent that has never had a native human population and the continent's extreme conditions hamper the activities of people there. Everything required for the maintenance of life and for carrying out activities must come from outside Antarctica. As in other parts of the world, human activities in Antarctica are conditioned by natural setting and history (Beltramino 1993). Chapter 2 describes the natural setting, and this Chapter provides an overview of past and present human activity in Antarctica.

EPA's Final Rule will apply only to nongovernmental activities of U.S.-based operators organized in or proceeding from the U.S. to Antarctica for which advance notification must be given pursuant to Article VII (5) of the Antarctic Treaty.[2] However, the information in this Chapter

[1] Whiteout conditions occur when land and sky blend as a homogeneous white color, as snow blows over the snow-covered land surface and into the atmosphere with no visible dark objects or shadows to distinguish land from sky.

[2] The Final Rule will be issued pursuant to the Antarctic Science, Tourism, and Conservation Act of 1996 and will implement the requirements of Article 8 and Annex I to the Protocol on Environmental Protection to the Antarctic Treaty of 1959.

includes an overview of historical and current governmental and nongovernmental activities, including those of both U.S.- and foreign-based operators, in order to fully delineate the realm of human activities in Antarctica, information that is relevant to the cumulative impacts of humans in Antarctica. The Chapter first presents a brief overview of historical activities, including exploration and sealing, whaling and fishing, and how these early activities led to controls that now govern them. Next is a brief summary of the establishment of national programs in Antarctica, including the United States Antarctic Program and a summary of its current operations. The Chapter then provides an overview of nongovernmental activities in Antarctica with the focus on ship-based tourism by U.S. operators.

3.2. Historical Exploration, Sealing, Whaling and Fishing

Antarctica was the last continent to be discovered, and most of what is known about Antarctica was discovered in the twentieth century (External Panel 1997).

3.2.1. Early Explorations and Sealing, Whaling and Fishing

Following Sir Francis Drake's discovery of the Drake Passage in 1578, the subantarctic islands were discovered over the next 150 years. Edmond Halley crossed the Antarctic Convergence in 1700, and Captain James Cook became the first to cross the Antarctic Circle in 1773.

Captain Cook's ship logs noted large numbers of seals and whales in the high southern latitudes, and as this word spread, seal hunting began in the Falkland Islands. British sealers came in 1778, and American sealers in 1792 (External Panel 1997). With huge profits to be made, subantarctic seals were decimated. Sealers pushed farther south in search of new sealing grounds. Exploration continued into the 1800s including discovery of the South Shetland Islands, the Antarctic Peninsula and the Weddell Sea. Sealing increased with these discoveries. Millions of seal skins were taken, with as many as three million skins taken from the Juan Fernandez Islands alone. By the mid-1800s, fur seals and then elephant seals were reduced almost to extinction, at which point the sealers largely abandoned this activity (External Panel 1997). No seal hunting has taken place in the Antarctic since 1964, and the populations of fur and elephant seals have significantly increased. In 1972, Antarctic Treaty[3] nations concluded an agreement to prohibit the taking of fur, elephant and Ross seals, and to limit the annual catch of various other species; this agreement, the Convention for the Conservation of Antarctic Seals, entered into force in 1977 (External Panel 1997 and Marine Mammal Commission, *1998 Annual Report*).

Whalers also came south to hunt southern right whales whose fat, along with that of elephant seals, was rendered into oil. Petroleum oil began to compete with whale and seal oil in the 1850s,

[3] The Antarctic Treaty was concluded in 1959 and entered into force in 1961. The Antarctic Treaty and the related measures and independent agreements adopted by the Treaty Parties are known collectively as the Antarctic Treaty System, summarized in Chapter 5 and Appendix 26.

but the need for baleen continued to drive the whaling industry. A whaling factory was operated at Deception Island from 1912-13 to 1915-16 and from 1920-21 to 1930-31 during the summer seasons (Beltramino 1993). In 1931, 40,199 whales were caught in the Antarctic, while 1,124 were caught in the rest of the world (External Panel 1997).

Alarmed by the rapidly diminishing stock of whales, the British government established the Discovery Committee in 1923. The Committee's work ultimately led to whale conservation recommendations. In 1931, 26 countries agreed to a regulatory convention which entered into force in 1936, and in 1937, nine countries agreed to minimum size restrictions of whales to be taken. Nonetheless, during the 1937-38 season, over 46,000 whales were killed. Worldwide whale hunting reached its peak in 1964-65, when 64,680 whales were killed, almost half in Antarctica (Tatoh 1984).

In 1994, the International Whaling Commission declared Antarctic waters a whale sanctuary in which no commercial whaling is allowed (External Panel 1997). Since 1988, Japan has issued permits for research whaling including one for the catch of up to 440 minke whales in the Southern Ocean (Marine Mammal Commission, *1998 Annual Report*).[4] [5]

The Antarctic fishery is a small fraction of the world's total catch of about 80 million tons, and is regulated by the 1982 Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). The Soviet Union had begun commercial fishing in Antarctica in 1967, and by 1971, its Southern Ocean catch was an estimated 300,000 tons. Modest annual increases continued through 1990-91 when the Soviet long-distance fleet was discontinued. Two U.S.-based firms briefly engaged in crabbing in recent years, but both companies ceased these operations (External Panel 1997).[6]

In 1995-96, ten nations, led by Japan, Poland and Ukraine, landed 115,188 metric tons (mt.) of which 91 percent was krill (104,821 mt.) and the rest finfish (10,367 mt.) (External Panel 1997). During the 1997-1998 season, 80,802 mt. of krill were reported caught, down slightly from the 1996-1997 fishing season; the total reported catch of finfish of 11,419 mt., up slightly from the reported catch in 1996-1997 (Marine Mammal Commission, *1998 Annual Report*). During the 1998-1999

[4] The International Convention for the Regulation of Whaling allows member nations to issue permits to its citizens to kill whales for scientific research purposes, provided that research plans are submitted to the IWC's Scientific Committee for review and comment before the permits are issued. The IWC adopted a resolution that, amongst other things, expressed concern that whale meat resulting from Japan's research program was being sold in commercial markets despite the moratorium on commercial whaling (Marine Mammal Commission, *1998 Annual Report*) .

[5] During the 1999-2000 austral season, Japanese whalers took 439 Minke whales under permit issued by the Japanese Minister of Agriculture, Forest and Fisheries, fifty more than taken during the 1998-1999 season (ANAN-19/08, Apr. 12, 2000).

[6] The first experimental crab fishery was in the 1991-92 season and no crab fishing has been done since 1996 (Hofman 1999).

season, vessels from 15 CCAMLR member countries, including the U.S., participated in CCAMLR-managed fisheries. The principal species harvested were krill, Patagonian toothfish (*Dissostichus eleginoides*), Antarctic toothfish (*D. mawsoni*), and mackerel icefish (*Champsocephalus gunnari*). During 1998-1999, vessels from Argentina, Japan, Poland, the Republic of Korea, and the Ukraine caught a reported 103,318 mt. of krill. These countries anticipate a similar krill catch in 1999-2000. The total reported catch of finfish during 1998-1999 was 18,006 mt., 17,435 mt. of which was Patagonian or Antarctic toothfish, which is marketed in the U.S. as Chilean sea bass (Marine Mammal Commission, *1999 Annual Report*).

The apparently continuing high level of illegal, unreported, and unregulated fishing of Patagonian toothfish in the Treaty area is of great concern to the Treaty Parties. The unreported catch of toothfish was estimated to be more than 22,000 mt. during 1997-1998 (Marine Mammal Commission, *1998 Annual Report*), and during 1998-1999, the toothfish catch was estimated to be several times more than the 17,000 mt. legally caught by CCAMLR-managed fisheries (Marine Mammal Commission, *1999 Annual Report*).[7] Also, several species of seabirds and other non-target species are caught and killed incidental to commercial fisheries, and many are also caught and killed in lost and discarded fishing gear, or die from eating plastics and other non-digestible items discarded at sea. For the 1997-1998 and the 1998-1999 reporting periods, there were reductions during both seasons in the observed seabird mortality in the regulated fisheries (Marine Mammal Commission, *1998 Annual Report*).

3.2.2. Early Scientific Explorations

Sealing continued to be the driving force for exploration throughout the 1800s. James Weddell, an explorer, naturalist and geographer as well as a sealer, was the first to note that management of the South Shetland Island fur seal population could provide a sustainable annual harvest of about 100,000 skins and that over-harvest destroyed the breeding population. George Powell, a sealer and amateur naturalist, joined with Nathaniel Palmer in search of new sealing grounds. Discovering the South Orkney Islands, but no seals, Powell made an exploratory landing and took readings and samples. Palmer's final voyage included the first scientist to visit Antarctica, Dr. James Eights, who discovered pycnogonids (or sea spiders) (Hedgpeth 1960) and collected the first fossils. As sealing continued, new islands were discovered and thousands of miles of new coastline were charted.

A Norwegian whaling expedition in 1893-94 discovered lichens on the rocks at Possession Island, the first time vegetation had been seen in the Antarctic. The biological and geological specimens collected during this expedition served as the impetus for the scientific explorations of the 1900s.

[7] None of the identified toothfish poaching vessels or owners/operators are from the United States (ISOFISH 2000).

In 1895, participants in the Sixth International Geographical Congress called for further exploration of the Antarctic region. Scientific expeditions were undertaken by Australia, Belgium, Britain, France, Germany, Japan, Norway, Scotland and Sweden. Exploration of the continent continued in the early 1900s, including the continental interior and the Dry Valleys, and the first expedition to the South Pole. By the late 1920s, aerial reconnaissance and photography accompanied ground-based biology, geology, meteorology, and atmospheric studies.

Following World War II, government activities in Antarctica increased as technology developed during the war was applied to scientific exploration. This upsurge in research activity culminated in the cooperative scientific program in Antarctica undertaken as part of the International Geophysical Year (IGY) in 1957-58, with much of the field work performed in Antarctica.[8] The IGY marked a turning point in the history of Antarctica. Initiated as a scientific exercise, IGY was organized at a nongovernmental level, but with support of the respective governments (Beltramino 1993). Twelve countries with scientific research and other interests in Antarctica established some 60 research stations as part of the IGY program. The countries included: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the United Kingdom, the United States, and the U.S.S.R. The participants devised informal arrangements for cooperation that formed the basis for a more formal agreement. This resulted in the conclusion of the Antarctic Treaty, signed by these same twelve countries in 1959 (U.S. Dept. of State 1999).

3.3 National Programs in Antarctica

As of the winter 1999, eighteen nations operated 44 research stations in Antarctica (SCAR Bulletin 1999)[9]. Activities range from summer-only seaborne expeditions focused on specific scientific questions to year-round operations with multiple research disciplines relevant to the Antarctic. Many of these nations operate additional stations and camps for field work feasible only during the summer (External Panel 1997). Most stations are on the coast. Only two year-round stations operate in the interior on the Polar Plateau: the United States operates the Amundsen-Scott South Pole Station, and Russia operates the Vostok Station. Appendix 2 lists the eighteen nations with stations and the areas where their stations are located; Table 3.1 summarizes this information (SCAR Bulletin 1999).[10]

[8] The IGY (July 1, 1957 to December 31, 1958), was a cooperative endeavor by scientists throughout the world to improve understanding of the Earth and its environment.

[9] Seven of the these 44 stations are north of 60 ?S.

[10] During the intensive 18-month International Geophysical Year (1957-1958), 12 nations operated about 60 year-round stations in Antarctica (External Panel 1997).

Table 3.1. Nations with Year-Round Stations in Antarctica, Winter 1999

Nation	No. of Stations	West Antarctica:		East Antarctica
		Peninsula Area	King George Is.	
Argentina	6	4	1	1
Australia	3			3
Brazil	1		1	
Chile	4	2	2	
China	2		1	1
France	1			1
Germany	1			1
India	1			1
Japan	1			1
Korea	1		1	
New Zealand	1			1
Poland	1		1	
Russia	6		1	5
South Africa	1			1
Ukraine	1	1		
United Kingdom	2	1		1
United States	3	1		2
Uruguay	1	1		
TOTALS	37	10	8	19

Source: SCAR Bulletin 1999

The year-round stations serve as research and data collection centers and also as support depots for the temporary research activities including summer camps, traverses, and airborne data collection. Most stations receive personnel and supplies by ship. Only five of the year-round stations can sometimes land wheeled airplanes.[11]

The research stations, and associated ship-supported research in the Southern Ocean, accommodate citizens from approximately 30 nations who are in Antarctica to perform or support

[11] The five stations that can land wheeled airplanes are: Marambio (Argentina), Frei (Chile), Rothera (U.K.), McMurdo (U.S.) and Mirnyy (Russia) (External Panel 1997).

government-sponsored research activities.[12] During the summer, the total number of scientists and support personnel peaks at about 4,000, and drops during the winter months to about 1,000. Of this population, approximately 1,600 (summer) and 200 (winter) are associated with the U.S. Antarctic Program (Table 3.2).

Table 3.2. Summer and Winter Populations for the U.S. Antarctic Program and Programs of Other Nations

Program	Summer (Population/%)	Winter (Population/%)
U.S. Antarctic Program	1,600/40%	200/20%
Other Nations	2,400/60%	800/80%

Source: External Panel 1997

3.4. U.S. Antarctic Program and Policy for Antarctica

3.4.1. U.S. Antarctic Program

The U.S. Antarctic Program (USAP), managed by the National Science Foundation, annually deploys scientists and support personnel to Antarctica and the Southern Ocean to support basic research in many disciplines, including: aeronomy and astrophysics, atmospheric chemistry, biology, earth sciences, ocean and climate systems, glaciology, environmental science, and certain types of applied research and technology development. The National Science Foundation provides direct field support for research projects and manages the major facilities that provide logistic and operational infrastructure support, including research vessels and the McMurdo, Amundsen-Scott and Palmer Research Stations. Appendix 6 provides a summary description of the features of these three stations (External Panel 1997). Visits to research stations are popular with tourists to Antarctica, and are scheduled through the National Science Foundation.

The scientific research of other federal agencies is also coordinated by the National Science Foundation. Appendix 6 lists these agencies and the types of research they conduct.

In addition to the permanent stations, approximately 30 field camps are established each austral summer under the USAP to support specific projects. Appendix 6 summarizes these facilities which include: summer research camps, huts, and temporary tent shelters. These facilities are established to meet the requirements of the scientists and their associated activities, including possible emergencies associated with their activities. The National Science Foundation does not allow any tourist visits to be scheduled at these facilities.

[12] Antarctica has never had an indigenous human population, nor does the Antarctic Treaty recognize any type of Antarctic citizenship.

Ships and aircraft are integral components of the USAP. Appendix 6 lists the types of vessels and aircraft and summarizes their function. As with the stations and field camps, these support vessels and aircraft are intended to support the scientific activities of the USAP. The National Science Foundation does not schedule tourist visits aboard these vessels or aircraft.

3.4.2. U.S. Antarctic Policy

The USAP is the cornerstone of the United States' interests, policy, and presence in Antarctica. The U.S. Antarctic policy is based on the following four fundamental objectives (External Panel 1997):

- Protecting the relatively unspoiled environment of Antarctica and its associated ecosystems;
- Preserving and pursuing unique opportunities for scientific research to understand Antarctica and global physical and environmental systems;
- Maintaining Antarctica as an area of international cooperation reserved exclusively for peaceful purposes; and
- Assuring the conservation and sustainable management of the living resources in the oceans surrounding Antarctica.

In 1958, the U.S. invited the 11 other Antarctic IGY nations to help draft an Antarctic Treaty based on the proposition that Antarctica be open to all nations to conduct scientific and other peaceful activities. The Antarctic Treaty, concluded by these twelve countries in 1959, entered into force in 1961 and is the keystone of U.S. Antarctic policy.

3.5 Nongovernmental Activities in Antarctica

Historically, as summarized in Section 3.2, nongovernmental activities in Antarctica involved exploration and sealing, whaling and fishing. However, tourism is now the primary nongovernmental activity.[13] As of the 1999-2000 austral season, nine U.S.-based tour operators seasonally offer ship-based tours to Antarctica, eight of which are members of the International Association of Antarctica

[13] Tourists are visitors who are not affiliated in an official capacity with an established national Antarctic program. They include both fare-paying passengers, whose numbers are usually reported reliably by tour operators, and private expedition members and adventurers aboard sea and airborne vessels, whose numbers are more difficult to determine (Enzenbacher 1992).

Tour Operators (IAATO).[14] In addition, one U.S.-based foundation conducts ongoing tourism-related research in the Peninsula area. For the 1999-2000 season, there were two additional U.S.-based nongovernmental expeditions: a cruise line tour company included sailing into Antarctic waters in its world voyage itinerary, and a filming company conducted a one-time documentary filming expedition.

There are also tour operators in other countries, most of which are ship-based operators and many of which are members of IAATO. There is one land-based operator, and overflights are offered by operators in two countries. Other nongovernmental expeditions have included activities such as those of Greenpeace International.

An overview of Antarctic tourism and of IAATO is provided in the next two sections. This is followed by a description of the ship-based expeditions of the U.S.-based tour operators, the land-based adventure tour operations, the nongovernmental research expeditions of U.S.-based Oceanites, Inc., and examples of other nongovernmental expeditions. Since tourism is the primary nongovernmental activity in Antarctica, particularly in the Peninsula area, the Chapter then continues with a discussion of tourist numbers, landing sites and activities with a focus on the Peninsula area, and concludes with a summary of tourism trends and out-year projections. Although EPA's Final Rule will apply only to nongovernmental activities of U.S.-based operators,[15] activities of foreign-based operators are included in this Chapter in order to provide a complete picture of the current realm of nongovernmental activities in Antarctica.

3.6. Overview of Antarctic Tourism

Tourism in the Antarctic region dates back to 1891, when the first tourists were passengers on resupply ships to the subantarctic islands (Codling 1995). Traders, whaling vessels, and mail delivery ships in the Antarctic region often carried paying passengers. World War I interrupted Antarctic exploration and the associated tourism (Codling 1995), but in the 1920s, mail, passenger and cargo service between the Falkland Islands and the whaling camps on the Antarctic islands resumed using ships designed to carry tourists (Griffiths 1994 and Griffiths 1980). These trips continued into 1971 when the last of these ships was withdrawn from service (Headland 1994). In 1940, Ernest Walker, in an attempt to defray the expenses of landing an expedition on the continent, proposed to use the *Windward* to make tourist cruises to the Antarctic after deploying his expedition (Headland 1994 and Griffiths 1980). However, World War II diverted logistical support from Antarctica, and no further plans for Antarctic tourism emerged until the mid-1950s (Headland 1994

[14] U.S.-based IAATO-member Expeditions, Inc., did not operate in Antarctica during the 1999-2000 season as planned; U.S.-based Cheesemans' Ecology Safaris joined IAATO after the start of the 1999-2000 season (Landau Jun. 3, 2000 and Biggs Jun. 16, 2000).

[15] EPA's final rule will apply to U.S.-based nongovernmental operators for which advance notification must be given pursuant to Article VII (5) of the Antarctic Treaty.

and Codling 1995). There is no record of the number of travelers to visit Antarctica in this fashion (Codling 1995).

The first Antarctic tour expedition after World War II was also the first tourist flight over Antarctic territory. On December 22, 1956, a Chilean Douglas DC-6B, carrying 66 passengers, flew from Chacabuco over the South Shetland Islands and Trinity Peninsula (Headland 1994). In 1957, a Pan American Airways Stratocruiser flew from Christchurch, New Zealand, to McMurdo Sound, and was the first commercial flight to land on the continent (Headland 1994). Ten years later, a tourist flight organized by the Admiral Richard Evelyn Byrd Polar Center of Boston flew over the South Pole as part of an around-the-world tourist flight.

Modern ship-borne tourism began in 1958 when an Argentinian vessel carried approximately 200 tourists to Antarctica on two separate voyages in January and February to the South Shetland Islands and the west coast of the Antarctic Peninsula. During this same period, Lars-Eric Lindblad of New York took 58 U.S. tourists from Ushuaia, Argentina, to the South Shetland Islands and Hope Bay (Headland 1994). Table 3.3 provides a brief chronology of tourism in Antarctica.

Table 3.3. Brief Chronology of Antarctic Tourism

Year	Event
1920s-71	Trips of opportunity aboard mail, passenger and cargo ships between the Falkland Islands and whaling camps on the Antarctic islands
1956	Chilean aircraft overflights of the South Shetland Islands and Antarctic Peninsula
1957	First commercial flight to Antarctica as Pan American Airways transports tourists from Christchurch to McMurdo Sound
1958	Ship landings on South Shetland Islands and Antarctic Peninsula
1966	Annual tourist voyages begin; Lars-Eric Lindblad initiates small vessel, educational tourism in Peninsula area
1968	First passenger ship crosses the Antarctic Circle
1971	National expeditions begin carriage of tourists
1971-72	Yachts begin transporting tourists to Peninsula area
1977	Continental overflights made from Australia and New Zealand
1979	Crash of tourist aircraft on Mt. Erebus; all 257 aboard killed
1982	Tourists flown from Punta Arenas to King George Island
1983-93	Hotel Estrella Polar Guest House operated on King George Island
1985	Vinson Massif scaled by Canadian climbers
1986	Antarctic Airways lands on blue-ice runway
1987-88	Patriot Hills land based recreation established by Adventure Network International
1988	First tourists visit the South Pole by means of land-based flight operations

Table 3.3. Brief Chronology of Antarctic Tourism	
Year	**Event**
1990	First tourists visit the Emperor Penguin colony at Dawson-Lambton Glacier
1991	First use of a helicopter by a cruise ship (Frontier Spirit) to take visitors ashore in Antarctica's Dry Valleys
1991	Formation of International Association of Antarctica Tour Operators
1993-94	First tourist cruise into the Weddell Sea
1993-94	Blue ice runways used for tourist landings
1994-95	Qantas re-establishes tourist overflights of Antarctica
1996-97	Russian ice breakers begin entering the Antarctic tourism market; circumnavigation of the continent by a tourist ship
1997	Skydiving expedition at South Pole results in death of three of the six divers

Sources: Enzenbacher 1993, Headland 1994, NY Times 1997, Washington Post 1997, and Quark IEE 1997

In 1968, Lindblad Travel, in association with Holm Shipping Company, extended Antarctic tourism for the first time into the Ross Sea. The Ross Sea voyage was the first tourist cruise to cross the Antarctic Circle and also the first to visit the historic huts of Carsten Borchgrevink, Robert Scott, and Ernest Shackleton (Headland 1994).

In 1970, Lindblad commissioned the *Lindblad Explorer*,[16] a ship specifically designed for Antarctica, and began tourist voyages to the subantarctic islands, the South Shetland Islands, and the Peninsula area. This region was chosen primarily because of its proximity to the South American ports, its milder summer climate relative to other areas of the Antarctic continent, the diversity of wildlife, the area's relative freedom from pack ice, and its concentration of research stations (Enzenbacher 1993).

Lindblad initiated the philosophy of tourism with an educational emphasis; excursions are led by qualified naturalists and historians aboard small vessels transporting few tourists, with small numbers of persons going ashore at one time (Stonehouse 1994).[17]

In the 1970s, Chilean and Argentine naval ships ferrying passengers and supplies to research bases on the South Shetland Islands and the Antarctic Peninsula also began to carry tourists. In addition to carrying passengers from the South American mainland, both countries used airstrips on Seymour Island and King George Island. Tourists were flown over the Drake Passage to ships already in Antarctica (Headland 1994).

[16] The *Lindblad Explorer* is still in use today as the *Explorer*.

[17] The Lars-Eric Lindblad "model" of ship-based tourism has been replicated by all IAATO tour operators and by Orient Lines (see Sections 3.8 and 3.9) (Underwood July 14, 1998).

In 1982, an international conference was held on King George Island at Chile's Presidente Eduardo Frei Station, with accommodations built at the station complex to house the visiting delegates. During the 1983-84 austral summer, Chile rented out these accommodations on a space available basis (Enzenbacher 1993). Carrying an average 40 tourists, C-130 aircraft continued to deliver guests to the newly-named Estrella Polar Hotel (Enzenbacher 1993 and Headland 1994). However, in 1992-93, Chile declined to carry passengers on official flights, thus temporarily ending tourist stays at the research station (Headland 1994). Since then, the Chilean regional airline, La Linea Aerea de la Patagonia (DAP), has offered a limited number of available seats to tourists to travel to Presidente Eduardo Frei Station (ANAN-17/03 Mar. 15, 2000).[18]

Private yachts also travel to Antarctica and since the 1980s there has been an increase in the number of these expeditions. In the past, their activities rarely were recorded as these vessels are not generally used for research or exploration (Headland 1989). The National Science Foundation identified nine yachts, as listed in Table 3.4, that have visited Palmer Station between 1989 and 1997. Of these, two were U.S.-flagged. Several yachts, some with small helicopters onboard, now charter to small groups of tourists and recently, an occasional yacht has wintered over in Antarctica (Headland 1989; ANAN-10/06 Dec. 8, 1999; and ANAN-11/13 Dec. 22, 1999).

Table 3.4. Yacht Visits to Palmer Station

Vessel Name	Flag	Year
Amria	French	1989
Antarctica	French	1992
S/V Beagle Star	United Kingdom	
Betelgeuse	United States	1992
C-Lise II	United States	1997?
S/V Chrysadale	French	
Cloud Nine		1992
Croix Saint-Paul II	French	1992, 1997
S/Y Curlew	United Kingdom	1992

Source: NSF (October 6, 1997, Revised: June 30, 1998)

[18] DAP has operated flights for several years from Punta Arenas, Chile, to King George Island to transport national program personnel and limited cargo. Over the years, DAP, in conjunction with affiliates, has offered available seats to tourists. Passengers may fly round-trip, stay overnight at the Presidente Frei complex, or opt for extended excursions via yacht or ski-equipped aircraft from Frei to other parts of the Peninsula area. An estimated 150 passengers have visited Antarctica via this process over the past 10 years (ANAN-17/03 Mar. 15, 2000).

The International Association of Antarctica Tour Operators (IAATO) now communicates regularly with yacht operators and other interested parties regarding Antarctic yacht activity. Several yacht captains and owners recently began participating in IAATO's annual meetings and the owner/operator of the *S/Y Pelagic* is an IAATO member (IAATO XXIII ATCM 1999). IAATO includes a report on commercial yacht activities in its annual report to the Antarctic Treaty Consultative Meeting. During the 1995-1996 season, 17 yachts made 22 expeditions to Antarctica carrying 150 people including 123 paying passengers (IAATO 1997). For the 1998-1999 season, a total of 90 passengers traveled to Antarctica aboard 11 commercial yachts.[19] These were the: *Pelagic, Damien II, Croix St. Paul II, S.W. Vorwerk, Golden Fleece*, and yachts organized through Croisieres Australes in France (*Baltazar, Boulard, Fernande, Kekilistrion, Kotick I, Valhalla*) (IAATO XXIII ATCM 1999). None of these yachts are owned or operated by U.S.-based operators.

In 1977, Qantas Airlines, based in Australia, and Air New Zealand, based in New Zealand, began offering charter flights with a total of five flights over different regions of the Antarctic continent. The number of flights increased to 16 in the 1977-78 season. These tourist flights ended, however, when an Air New Zealand DC-10 crashed into Mt. Erebus on November 28, 1979, killing all 257 passengers and crew. Only three tourist flights occurred in the years immediately following the crash (Headland 1994). Qantas Airways Ltd., in conjunction with Croydon Travel Centre (Australia), recommenced this service in 1994 (ANAN-16/05 Mar. 1, 2000).

In December 1986, Giles Kershaw, flying an Antarctic Airways[20] DHC-6 Twin Otter, demonstrated that wheeled aircraft could be landed on blue ice runways in Antarctica.[21] The next year, 12 flights were made by DC-4 aircraft between Punta Arenas, Chile, and a snow camp at Patriot Hills, Antarctica. From Patriot Hills, six flights were made using ski-equipped Twin Otters. Aircraft at the Patriot Hills camp carried mountain climbers, skiers and hikers to Vinson Massif; provided logistical and emergency support to transcontinental expeditions; and, for the first time, carried tourists to the South Pole (ANI 1998 and Headland 1994). Prior to the 1989-90 season, most of the short inland flights occurred during the November to March summer season. During the 1989-90 season, however, tourism flights also occurred from July to April (Swithinbank 1988 and Enzenbacher 1993).

[19] IAATO's 1998-1999 season report for yachts, which may be incomplete, was based on reports directly to IAATO, yachts reported at Arthur Harbor by the National Science Foundation, and information gathered by Argentina's Tourism Board (Terra del Fuego, Ushuaia) (IAATO 1999).

[20] Antarctic Airways is affiliated with Adventure Network International (ANI). ANI's operations are discussed in Section 3.10.

[21] Blue ice is a term used to distinguish areas of net ablation (evaporation) throughout the polar ice sheet. Blue ice areas remain free of snow and are recognized as potential landing sites for wheeled aircraft. McMurdo Station's Pegasus Runway and ANI's Patriot Hills runway are on blue ice areas.

Currently, commercial tour overflights of Antarctica are offered by companies in Australia and Chile. Croyden Travel Centre of Australia uses Boeing 747-438 aircraft from Qantas Airways Ltd. The 12-hour flight originates in Melbourne and includes several orbits over scenic areas of the continent at a minimum altitude of 10,000 feet. In 1994-95, Croyden conducted six charter flights; in 1995-96, nine flights were conducted that carried a total of 2,958 passengers along with a total of 202 air and cabin crew; and in 1999-2000 there were nine flights that carried about 3,500 passengers (Australia XX ATCM/INF Apr. 1996 and ANAN-16/05 Mar. 1, 2000). Antarctic flight seeing excursions of the Peninsula area are commercially available through Destination Management, which operates out of Santiago, Chile (HALW IEE 1999). The Chilean regional airline, DAP, offers a limited number of available seats on flights from Punta Arenas, Chile, to the Presidente Eduardo Frei Station complex on King George Island (ANAN-17/03 Mar. 15, 2000). Commercial aircraft operated by Adventure Network International fly tourists in and out of its Patriot Hills base camp as part of its continental expeditions operations (see Section 3.10).

3.7. International Association of Antarctica Tour Operators and an Overview of Ship-Based Tourism by IAATO Members

More than 98 percent of the tourists coming to Antarctica are ship-borne. The International Association of Antarctica Tour Operators (IAATO) was founded in 1991 "...to advocate, promote and practice safe and environmentally responsible private-sector travel to the Antarctic" (IAATO Bylaws 1991). Founded by seven operators,[22] IAATO currently has 29 member companies based in 10 countries.[23] Of these, 14 are Full Members, 5 are Provisional (New) Members, and 10 are Associate Members.[24] Of the 19 Full and Provisional Members (e.g., for-profit companies that organize and/or operate travel programs to the Antarctic), 8 are U.S.-based companies and represent 42% of the Full/Provisional membership.[25] The remaining 11 companies, representing 58% of the Full/Provisional membership, are based in Australia (3 companies), Canada (1), Germany (2), The Netherlands (1), New Zealand (1), and the United Kingdom/Falkland Islands (2/1); two of these 11 are yacht operators (U.K./Falkland Islands). All of the 19 Full/Provisional members are exclusively

[22] IAATO was founded by: Adventure Network International (Canada, now United Kingdom), Mountain Travel•Sobek (U.S.), Paquet/Ocean Cruise Lines (U.S.), Salen Lindblad Cruising (U.S.), Society Expeditions (U.S.), Travel Dynamics (U.S.) and Zegrahm Expeditions (U.S.) (IAATO Bylaws 1991).

[23] IAATO Membership Directory 1999-2000 (Landau Jun. 3, 2000).

[24] U.S.-based Expeditions, Inc., became a Provisional (New) Member in 1999, but moved to the Associate Member category when the company did not operate in Antarctica during the 1999-2000 season as planned; U.S.-based Cheesemans' Ecology Safaris became a Provisional member in 2000 and IAATO included the company in the U.S.-based IAATO-member Initial Environmental Evaluation for expeditions for the 2000-2001 season (Landau Jun. 3 2000; Biggs Jun. 16, 2000; and IAATO IEE 2000).

[25] Should Expeditions, Inc., return to Provisional membership status, then the 9 U.S.-based companies would represent 47% of the 19 Full/Provisional members.

ship-based operators and all except Marine Expeditions, with its operations in Canada, operate from countries that are Parties to the Protocol on Environmental Protection to the Antarctic Treaty. Appendix 7 lists the objectives of IAATO, the membership criteria, the Bylaws, and membership as of June 2000.

According to IAATO, small ships provide an ideal platform for viewing and experiencing the Antarctic environment in comfort, with the tour vessel serving as a floating hotel (IAATO IEE 1997).[26] The near shore waters are generally deep, allowing for daily sightings of whales, seals, and penguins. IAATO members maintain a self-imposed limitation of less than 400 passengers per trip.[27] Currently, IAATO-member tour vessel capacities range from 36 to 180 passengers.[28] Cruise ships are equipped with rubber inflatable boats ("Zodiacs") providing passengers with opportunities to go ashore. Two of the U.S.-operated ships are also equipped with helicopters to find routes through dense sea ice and to scout for whales. Helicopters are also used by one of the U.S. operators for flight-seeing over inland areas, such as the Dry Valleys near McMurdo Station and occasional inland landings.

As described by IAATO, typical ship borne tours range in length from 8 to 21 days. Occasionally there are longer voyages. The circumnavigation cruise by Quark Expeditions during the 1996-97 season lasted 66 days; however, this is not typical of ship-based tours in Antarctica (Quark IEE 1997). Of the total voyage time, crossing the Southern Ocean takes approximately two days in each direction if the Antarctic Peninsula is the destination, and approximately five days in each direction if McMurdo Sound is the destination. If the remote coastal area of East Antarctica is the destination, crossing times can take as much as seven days in each direction. Most ships tour the Peninsula area and the associated subantarctic islands. Section 3.13 discusses tourist numbers in the Peninsula and Ross Sea areas.

[26] Small is a relative term in that these tour vessels are larger than yachts but carry no more than 400 passengers with no more than 100 passengers going ashore at any one time. See: Bylaws of the International Association of Antarctica Tour Operators, Appendix 7.

[27] The 400-passenger limit was determined, in part, by the fact that the seven founding members of IAATO included Paquet/Ocean Cruise Lines which operated the 400-passenger *Ocean Princess* at the time. (IAATO XXIII ATCM 1999).

[28] U.S.-based Orient Lines, discussed in Section 3.9.1, also offers annual tours to Antarctica aboard the *Marco Polo*. Although the passenger capacity is 850, the vessel carries about 500 passengers per Antarctic voyage and, similar to IAATO members, lands only 100 passengers at a time. U.S.-based Holland America Line, Westours, Inc., discussed in Section 3.9.2, included cruising through Antarctic waters in its Year 2000 world cruise of the *ms Rotterdam*. This vessel carried 936 passengers and 656 crew, and was one of the largest to visit Antarctica during the 1999-2000 season. The vessel did not anchor and there were no passenger landings during the three days of cruising through Antarctic waters.

Once tour ships arrive in Antarctic waters, IAATO-member tour operators will generally make up to three landings per day with as many as 100 tourists and guides going ashore at one time.[29] A typical landing employs several Zodiacs equipped with 25- to 40-horsepower outboard engines. While the ship stands-off, the Zodiacs carry approximately 12 passengers each and proceed to a landing site which is usually no more than a mile from the ship. The topography varies considerably from site to site. While some sites offer protected beach landings, in the Peninsula area most sites are rocky and may require the Zodiacs to get to the shore through a small ocean break zone. As described by IAATO, once on shore, the chief attraction is usually the congregations of Antarctic wildlife, occurring in some places as large monospecific colonies of penguins or as several patches of different types of penguins and nesting seabirds; seals and a range of plant species are also attractions. Some of the landing sites commonly visited by tourists are quite small, while others are expansive and allow for short hikes. For IAATO-member operators, the typical shore visit generally lasts no more than three hours, but is dependent on weather conditions and other considerations such as the availability of wildlife.

In the McMurdo Sound region, the historic huts are the chief attractions for tourists. In particular, Robert Falcon Scott's Discovery and Cape Evans Huts, and Sir Ernest Shackleton's Cape Royds Hut, all on Ross Island, provide well-preserved records of the early days of Antarctic exploration. The Shackleton Hut is in close proximity to an Adelie penguin colony. Nongovernmental visitors to both McMurdo Sound and the Peninsula area sometimes tour U.S. government research stations, provided that advanced notice is given and permission is received from the National Science Foundation.

The Protocol on Environmental Protection to the Antarctic Treaty, signed by the United States in 1991, provides standards for all visitors to Antarctica. Early guidelines for visitors developed by tour operators reflected many of the elements of the Protocol. In 1991, IAATO incorporated adherence to the Antarctic Conservation Act and the obligations of "*Guidance for Visitors to the Antarctic"* and "*Guidance for Those Organising and Conducting Tourism and Non-governmental Activities in the Antarctic,"* as adopted by the Antarctic Treaty Consultative Meeting as Recommendation XVIII-1, in its Bylaws as a requirement for membership (IAATO Bylaws 1991).[30] These documents are included in Appendix 8.

[29] The tourist/guide ratio is a self-imposed limitation for IAATO members. See Section 3.8.

[30] Recommendation XVIII-1 was adopted at the Eighteenth Antarctic Consultative Meeting in Kyoto, Japan, April 11-24, 1994.

3.8. Ship-Based Tourism by U.S.-Based IAATO Member Operators

In accordance with 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica,"[31] IAATO submitted Initial Environmental Evaluations to the Environmental Protection Agency for ship-based tourism in the Peninsula area on behalf of its U.S.-based IAATO member operators for the expeditions undertaken during the 1997-98, 1998-99, 1999-2000, and 2000-2001 seasons (IAATO IEE 1997, IAATO IEE 1998, IAATO IEE 1999, and IAATO IEE 2000)[32]. For all four seasons, the conclusion of the U.S.-based operators in these documents was that the continuation of Peninsula area cruises under the described process will have no more than a minor or transitory impact on the Antarctic environment.[33] For all four seasons, the Environmental Protection Agency, in consultation with other interested federal agencies, concluded that these Initial Environmental Evaluations for the U.S.-based IAATO-member operators met the requirements of Article 8 and Annex I of the Protocol on Environmental Protection and the provisions of 40 CFR Part 8 (Dickerson Oct. 20, 1997; Dickerson Sep. 24, 1998; Dickerson Sep. 30, 1999; and Montgomery Oct. 18, 2000).

These Initial Environmental Evaluations (IEEs) describe ship-based tourism as conducted by the U.S.-based IAATO members.[34] Although submitted on behalf of U.S.-based member operators,

[31] Environmental impact assessment documentation, which may include an Initial Environmental Evaluation, is required by Annex I of the Protocol on Environmental Protection, and by 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica." The Protocol, including Annex I, entered into force on January 14, 1998, following ratification by the Treaty Parties; 40 CFR Part 8 became effective April 30, 1997.

[32] EPA's rule at 40 CFR Part 8, Article 2 of Annex I to the Protocol requires that unless it has been determined that an activity will have less than a minor or transitory impact, or unless a Comprehensive Environmental Evaluation is being prepared in accordance with article 3 of Annex I, an Initial Environmental Evaluation must be prepared. (40 CFR § 8.7)

[33] The 1997-98 IEEs were submitted by IAATO on behalf of: Abercrombie & Kent/Explorer Shipping, Mountain Travel•Sobek, Quark Expeditions, Society Expeditions, and Zegrahm Expeditions. The 1998-99 IEEs were submitted by IAATO on behalf of these five operators, Clipper Cruise Line, and Lindblad Special Expeditions. The 1999-2000 IEEs were submitted by IAATO on behalf of these seven operators and Expeditions, Inc. The 2000-2001 IEEs were submitted by IAATO on behalf of these seven operators and Cheesmans' Ecology Safaris and Victor Emanuel Nature Tours; Society Expeditions did not, however, operate in Antarctica during the 2000-2001 season.

[34] In accordance with 40 CFR 8.4(d), the document "Initial Environmental Evaluation, Ship Based Tourism by Five U.S. Organizers, Antarctic Peninsula, South Shetland Islands and South Orkney Islands, November 1997-March 1998," prepared by IAATO, October 15, 1997, on behalf of its U.S.-based member organizers was incorporated into the Initial Environmental Evaluations submitted for the U.S.-based organizers for the 1998-99, 1999-2000, and 2000-2001 seasons. The 1997 document was prepared for IAATO's U.S.-based and Australian-based members and describes Antarctic tourism as practiced under IAATO's Bylaws which apply to all IAATO members and includes measures to mitigate environmental impacts.

these documents describe ship-based tourism as conducted by all IAATO members (e.g., U.S. and foreign-based) (Landau Jul. 19 2000). In these IEEs, the U.S.-based IAATO member operators maintain that shipboard tourism provides a means, within the provisions of the Antarctic Treaty and the Protocol, to meet the tourism demand without the need for permanent infrastructure and with limited residence time. The tour vessel functions as a floating hotel. IAATO member tours are based on the Lindblad philosophy of small-scale tourism with an educational emphasis during which these "...[s]hip-based expeditions provide an opportunity for visitors to experience a wide range of areas of interest, including wildlife sites, historic sites, active research stations, and sites of exceptional wilderness and aesthetic value (IAATO IEE 1997)."[35] [36]

The IEEs provide information on the general operations and practices of the U.S.-based IAATO-member operators for expeditions in the Peninsula area. In general, IAATO-member vessels carry from 50 to 300 persons, including officers, crew, staff and passengers. The average passenger load for IAATO-member vessels ranges from 25 to 150, with the estimated average passenger load for the U.S.-based operators being 25 to 120. The expeditions of the U.S.-based IAATO member operators proceed according to standard operating procedures for voyage activities and landings published in the *Expedition Leader's Notebooks*, which include guidelines for operation of Zodiacs around wildlife, emergency contingency plans and reporting procedures. In accordance with IAATO Bylaws and standards, U.S.-based IAATO member operators limit the maximum number of persons ashore at any one time to 100, and maintain a minimum 1:20 ratio of staff to passengers. Site visits for passengers may last about three hours (IAATO Bylaws 1991, IAATO IEE 1997, and IAATO IEE 1999).

Each season, U.S.-based IAATO member operators propose routes and itineraries which are submitted to the Department of State as part of the operator's notice of intent to travel. However, as discussed in the IEEs for the U.S.-based IAATO member operators, the actual routes and sites visited may vary in response to local weather conditions, presence or absence of animal populations of interest, and environmental and safety considerations. Before any landing, the expedition leader and captain consult various maps and review reference information on the site to verify there are no protected areas in the vicinity of the proposed landing site. Final decisions regarding the itinerary, including any decisions not to land, are made in the field by the expedition leader and captain. As a matter of policy and practice, expedition leaders coordinate tour schedules so that no two ships are

[35] As previously noted, small is a relative term in that these tour vessels are larger than yachts but carry no more than 400 passengers with no more than 100 passengers going ashore at any one time. See: IAATO Bylaws, Appendix 7.

[36] As previously noted, the Lars-Eric Lindblad "model" of ship-based tourism has been replicated by all IAATO tour operators and by Orient Lines (see Sections 3.8 and 3.9) (Underwood Jul. 14, 1998).

in the same place at the same time; expedition operators receive approval from the National Science Foundation for visits to U.S. research stations (IAATO IEE 1997).[37]

For U.S.-based IAATO members, IAATO membership also places requirements on crew experience and on education of both staff and passengers. IAATO requires that its members hire staff with a minimum of 75% previous Antarctic experience overall. In addition, all crew are given specific, formal information on the obligations of the Antarctic Treaty System including a copy of Recommendation XVIII-1, *Guidance for Antarctic Visitors*. Periodic mandatory briefings are held for crew in their own languages (IAATO IEE 1997).

Education is an ongoing process for passengers of U.S.-based IAATO member tours. Pre-departure materials for passengers include information on safety and conservation, an Antarctica Primer, and a copy of Recommendation XVIII-1. Passengers also receive a copy of the National Science Foundation pamphlet, *Conservation of Antarctic Seabirds*.[38] On board, there are regular briefings for passengers. For cruises with U.S. citizens, the video, *Behold Antarctica*, produced by the National Science Foundation, is shown to highlight U.S. obligations under the Antarctic Conservation Act. All passengers again receive a copy of Recommendation XVIII-1. An initial briefing on Antarctic conservation and etiquette ashore is held before the first landing and features an IAATO-produced slide presentation reinforcing Recommendation XVIII-1. Education continues throughout the cruise with lecture programs, which emphasize sound environmental practices around wildlife in the Antarctic, and documentary videos. Each U.S.-based IAATO member's vessel carries a small polar library, including documents on the Antarctic Treaty System (IAATO IEE 1997).

For U.S.-based IAATO member operators cruising in the Peninsula area, site selection is a flexible, opportunistic process by which expedition leaders select and manage activities at landing sites. Appendix 9 summarizes the elements in this process. Opportunistic landings and excursions in the Peninsula area take place at sites on the Peninsula mainland and on offshore islands and include areas of scenic and wilderness interest, scientific stations, historic sites and areas where a specific physical activity is possible. Landing activities are generally limited to supervised walks for observing wildlife and nature (IAATO IEE 1997).

Before passengers are allowed to disembark, the expedition leader and any official observers make a reconnaissance of the landing site to evaluate safety and environmental conditions. Boot washing stations are standard on all U.S.-based IAATO member tour vessels to prevent introduction

[37] IAATO members meet annually during which time station visits are scheduled with the National Science Foundation and any new, pertinent information is provided to the operators. Such information may include new or modified national regulatory requirements and identification of any new Antarctic Specially Protected Areas or Antarctic Specially Managed Areas.

[38] This pamphlet informs the reader about the Antarctic Conservation Act by describing Antarctica's birds and their habitat, and by providing conservation tips and other related information.

of alien species, and passengers and staff clean their boots before and after each landing (IAATO IEE 1997).

U.S.-based IAATO member operators do not allow passengers onshore to engage in any activities that may adversely affect wildlife or the environment. To ensure that the likelihood of any impacts on flora, fauna and geological features are no more than minor or transitory, the operators ensure that onshore passenger activities are conducted in accordance with Recommendation XVIII-1, other relevant laws and regulations,[39] and IAATO standards (IAATO Bylaws 1991). The number of visitors and time ashore are managed by U.S.-based IAATO member operators in consideration of safety, weather, environment, schedules and the nature of the group (IAATO IEE 1997).

For U.S.-based IAATO member operators, a typical landing for 90 passengers includes four Zodiacs, each carrying 12 passengers ashore. Zodiac cruises around ice floes, along coastal cliffs, or to other areas of interest are often offered in conjunction with landings, particularly where sites offer limited visitor space or during critical periods of the breeding cycle for the area's fauna. The minimum staff/passenger ratio ashore is 1:15-20,[40] and passengers remain within sight of the staff with most staff remaining ashore for the full duration of the landing. The visit lasts about three hours; during this time passengers may observe and photograph wildlife and the landscape. Passengers are not allowed to enter any man-made structures unless specifically invited to do so by an authorized person. Depending on the site, staff may conduct supervised walks or be positioned at key areas to provide information and point out sensitive features to avoid. For U.S.-based IAATO member operators, passengers are advised of their obligations under the Antarctic Treaty and the legal implications; the most likely sanction for flagrant disregard of the rules by a passenger would be the immediate removal from the site and prohibition, by the ship's captain, of further landings by that passenger (IAATO IEE 1997).

For U.S.-based IAATO member operators, conditions which may lead to a decision not to land include: presence of another vessel; a science program in progress; passenger safety being compromised; poor local weather conditions; limited or no landing area to accommodate the planned number of people going ashore while maintaining a safe distance from animals; an inexperienced or difficult group of passengers; unavoidable abundant plant life close to or at the proposed landing site; significant likelihood of disturbing birds nesting close to the landing site; or the presence of abundant seals, especially fur seals (IAATO IEE 1997).

Quark Expeditions is the only U.S.-based IAATO member operator that offers flight seeing as part of its two cruises with the vessel, the *Kapitan Khlebnikov* (Quark IEE 1998). The helicopters

[39] See the discussion in Section 5.4 of systems governing human activities in Antarctica including nongovernmental activities.

[40] The IAATO Bylaws provide that members agree to not have more than 100 passengers ashore at any one site at the same time. IAATO members also agree to maintain a minimum 1:20 ratio of staff to passengers.

are used to provide passengers with aerial views of the ship navigating in the ice, for landings otherwise inaccessible by Zodiac, and for flight seeing excursions including the Dry Valleys area. Appendix 10 summarizes Quark's use of the helicopters.

In accordance with 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica (40 CFR Part 8)," Quark Expeditions submitted Initial Environmental Evaluations to the Environmental Protection Agency for the expeditions aboard the *Kapitan Khlebnikov*, including the helicopter operations, undertaken during the 1997-98, 1998-99, 1999-2000, and 2000-2001 seasons (Quark IEE 1997, Quark IEE 1998, Quark IEE 1999, and Quark IEE 2000). For all four seasons, Quark concluded that the continuation of these expeditions under the described process will have no more than a minor or transitory impact on the Antarctic environment. For all four seasons, the Environmental Protection Agency, in consultation with other interested federal agencies, concluded that Quark's Initial Environmental Evaluations met the requirements of Article 8 and Annex I of the Protocol on Environmental Protection and the provisions of 40 CFR Part 8 (Dickerson Nov. 17, 1997; Dickerson Oct. 28, 1998; Dickerson Sep. 30, 1999; and Montgomery Oct. 18, 2000).

3.9. Ship-Based Tourism by Other U.S.-Based Operators

In addition to the U.S.-based IAATO member operators, two other U.S.-based operators have conducted ship-based tour voyages to Antarctica. Orient Lines, Inc., has offered ship-based tours with passenger landings since 1993-1994, while Holland America Line-Westours, Inc., included cruising through Antarctic waters without any passenger landings in its Year 2000 world cruise.

3.9.1. *m/v Marco Polo* Cruises by Orient Lines, Inc.

Orient Lines, Inc., based in Fort Lauderdale, Florida, has offered cruises in the Peninsula and McMurdo Sound areas since the 1992-93 season. Beginning with the 2000-2001 season, the *Marco Polo* will cruise only in the Peninsula area (Orient Lines IEE 2000). Although not a member of IAATO,[41] Orient Lines observes IAATO's practices as expressed in their Bylaws and other recommendations in its operations (Orient Lines IEE 1998). The size of the *Marco Polo* and the number of passengers carried per expedition distinguishes Orient Lines from IAATO members. Table 3.5 compares the carrying capacity of the *Marco Polo* with the *Hanseatic*, the largest vessel of an IAATO member (Hapag-Lloyd, Germany) and the *Clipper Adventurer*, the largest vessel operated by U.S.-based IAATO members (Clipper Cruise Line and Zegrahm Expeditions).

[41] Orient Lines had applied for IAATO membership. However, IAATO's Bylaws require that Full, Provisional and Probationary Members agree not to carry more than 400 passengers per trip. The *Marco Polo* has a passenger capacity of 850 and an estimated average passenger load of about 500; thus, Orient Lines is not a member of IAATO (IAATO Bylaws 1991; and Fogelberg, Oct. 4, 1999).

Table 3.5. Carrying Capacity Comparison of the *Marco Polo* to the *Hanseatic* and the *Clipper Adventurer*			
Vessel	*Marco Polo*	*Hanseatic*	*Clipper Adventurer*
Operator(s)	Orient Lines	Hapag-Lloyd	Clipper Cruise Line Zegrahm Expeditions
IAATO Member(s)	No	Yes	Yes
Passenger Capacity	850	180	120
Estimated Average Load	- 500	150	110-115
Difference:			
No. of Passengers		350	- 385
Percent		-330%	-435%

From: Orient Lines IEE 1998 and IAATO IEE 1999

Orient Lines' operations are similar in most respects to those of IAATO member operators including the U.S.-based IAATO members. The operational elements that are similar are summarized as follows:

• Proposed routes and itineraries are submitted to the Department of State as part of operator's notice of intent to travel.

• The ship's crew includes at least 75% with previous Antarctic experience, and the crew is advised and briefed on Recommendation XVIII-1, *Guidance for Antarctic Visitors*.[42]

• Standard Operating Procedures are delineated in the Safety Management System of the ship, which also includes helicopter operations.

• The passenger education program includes lectures on and distribution of Recommendation XVIII-1, and lecture programs on and library availability of appropriate laws and regulations. Passenger briefings before landings include safety considerations and how to avoid impacting wildlife and the local environment, identification of any protected areas, and reminder not to enter any man-made structures unless specifically invited to do so by an authorized person.[43]

[42] According to the Orient Lines IEE (1998), the majority of the ship's crew are from the Philippines, which is not a Party to the Antarctic Treaty, and has no Antarctic legislation. However, the Master of the ship has shipboard sanctions which may be used to ensure responsible behavior of crew members in Antarctica.

[43] Orient Lines' Initial Environmental Evaluation further specifies that passengers are reminded not to smoke in Zodiacs or onshore, not to take food items onshore, and that there are no toilet facilities available onshore (Orient Lines IEE 1998).

• Expedition leaders coordinate tour schedules so that no two ships are in the same place at the same time.

• Landing decisions are made aboard ship by the captain and expedition leader and, for the *Marco Polo*, the ship's ice master.

• The maximum number of passengers ashore at any one time is limited to 100 with a minimum 1:15 ratio of staff to passengers maintained.

• Site landings are under the supervision of the Expedition Leader. Passengers are landed via Zodiacs and while onshore remain in sight of staff at all times.[44] Passengers are not allowed to engage in any activities that may adversely affect wildlife or the environment. Passengers are not allowed to enter man-made structures unless specifically invited to do so by the Expedition Leader. Landing activities are generally limited to supervised walks and observation and photography of scenery and wildlife. Boot washing is required before and after each landing.

• The sanction for flagrant disregard of the rules by a passenger is immediate removal from site and prohibition of further landings by the ship's captain by that passenger.

• Advanced approval is obtained from the National Science Foundation for any visits to U.S. research stations with the schedule for these visits coordinated at the annual meeting of tour operators.

• Post-trip report forms are maintained and submitted to the National Science Foundation.

Because of the total number of passengers onboard the *Marco Polo* as compared to an IAATO member operator's vessel, individual passengers are likely to remain ashore for approximately one hour (actual times may vary from 45 to 90 minutes at a landing site), and the approximate duration of each landing is four to six hours (Orient Lines IEE 1998).

Orient Lines has selected landing sites based on the seven factors listed in Table 3.6. While Orient Lines does not operate by the in-field opportunistic process used by IAATO member operators, the site selection criteria employed by Orient Lines are similar to that of IAATO member operators, namely, that sites are selected on the basis of wildlife and scenic or historic interest, ability to avoid impacts, and weather and safety conditions.

[44] At least seven expedition staff members with previous Antarctic experience are on shore while passengers are landing ensuring a minimum ratio of about 1:15, and the expedition staff is assisted by several members of the ship's cruise staff to ensure protection of wildlife, vegetation, and protected areas, and to ensure safe operations (Orient Lines IEE 1998).

Table 3.6.	Factors Used by Orient Lines to Select Landing Sites
1.	Potential for avoiding impact on wildlife.
2.	Potential for avoiding impact on vegetation.
3.	Potential for avoiding impact on scientific research.
4.	Potential for avoiding impact on geological and wilderness values.
5.	Variety of wildlife to be seen.
6.	Scenic or historic interest of the site.
7.	Availability of reliable charts of site (good soundings, etc.)

From: Orient Lines IEE 1998

The sites selected by Orient Lines for landing in the Peninsula area include: Half Moon Island; Whaler's Bay, Deception Island; Waterboat Point, Paradise Harbor (Gon. Videla Station); Port Lockroy, Wiencke Island; and Hovgaard Island in the Lemaire Channel. In the Ross Sea area, the sites visited include: McMurdo Station, Cape Evans, Cape Royds and Cape Bird on Ross Island, and Terra Nova Bay in the Ross Sea area. The visit to Scott's Hut at Cape Evans, an Antarctic Specially Protected Area,[45] is conducted in accordance with the management plan and guidelines of Antarctica New Zealand under a permit issued to visit the site as specified in the management plan (Orient Lines IEE 1998).[46]

Orient Lines maintains an onboard helicopter that is used only for ice reconnaissance and to find a navigable route in the event pack ice is encountered. The helicopter is not used to offer any flight seeing for passengers. The Standard Operating Procedures for helicopter operations are included in the ship's Safety Management System. During reconnaissance flights, the helicopter crew adheres to the company's policy of never flying from the *Marco Polo* in reduced visibility (such as falling snow) or beyond a distance that can be safely reached from the vessel by either a Zodiac or a lifeboat (Orient Lines IEEE 1998).

In accordance with 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica," (40 CFR Part 8) Orient Lines submitted Initial Environmental Evaluations to the Environmental Protection Agency for the *Marco Polo* expeditions undertaken during the 1997-98, 1998-99, 1999-2000, and 2000-2001 seasons (Orient Lines IEE 1997, Orient Lines IEE 1998, Orient Lines IEE 1999, and Orient Lines IEE 2000). For all four seasons, Orient Lines concluded that the continuation of these expeditions under the described process will have no more than a minor or transitory impact on the Antarctic environment. For all four seasons, the Environmental Protection

[45] Scott's Hut at Cape Evans is an Antarctic Specially Protected Area designated Specially Protected Area No. 25 (see Appendix 5).

[46] During the 2000-2001 season, the *Marco Polo* will tour only in the Peninsula area and will not travel to the Ross Sea area (Orient Lines IEE 2000).

Agency, in consultation with other interested federal agencies, concluded that Orient Lines' Initial Environmental Evaluation met the requirements of Article 8 and Annex I of the Protocol on Environmental Protection and the provisions of 40 CFR Part 8 (Dickerson Nov. 28, 1997; Dickerson Oct. 22, 1998; Dickerson Sep. 10, 1999; and Montgomery Oct. 3, 2000).

3.9.2 *ms Rotterdam* Cruise by Holland America Line - Westours, Inc.

Holland America Line-Westours, Inc. (HALW), based in Seattle, Washington, included scenic cruising through waters in the Peninsula area of Antarctica in its Year 2000 world cruise (HALW IEE 1999). As a U.S.-based operator, HALW's 1999-2000 operations in Antarctica were distinctly different from those of other U.S.-based ship-based tour operators in that the expedition consisted solely of a voyage transiting Antarctica for a period of approximately 72 hours, during which time passengers could observe the surrounding environment from the vessel. The *ms Rotterdam* did not dock or anchor in Antarctica, there were no passenger landings nor did passengers leave the ship via the ship's tenders while in Antarctica.[47] Further, the ship had no onboard helicopters or other aircraft, nor were there any facilities onboard to refuel aircraft (HALW IEE 1999).

HALW is not a member of IAATO nor would the company be eligible for Full or Provisional Membership because of the number of passengers carried on the cruise (IAATO Bylaws 1991). According to HALW's Initial Environmental Evaluation for the expedition, the *ms Rotterdam* carries approximately 1,000 passengers and a crew of approximately 600.[48] The size of the *Rotterdam* and the number of passengers carried on this expedition distinguishes HALW from Orient Lines and from IAATO members. Table 3.7 compares the *Rotterdam* with the *Marco Polo* (Orient Lines, U.S.), the *Hanseatic*, the largest vessel of an IAATO member (Hapag-Lloyd, Germany), and the *Clipper Adventurer*, the largest vessel operated by U.S.-based IAATO members (Clipper Cruise Line and Zegrahm Expeditions).

[47] HALW initially proposed using the ship's tenders on a limited basis to provide passengers with an opportunity to visit areas inaccessible to the *Rotterdam*. As proposed, the tenders would not land or disembark passengers, would not travel more than two nautical miles from the ship, and would operate only during acceptable weather conditions. However, HALW withdrew this proposed activity. (HALW 1999, HALW IEE 1999, and Dickerson Apr. 16, 1999).

[48] During its 1999-2000 world cruise, the *Rotterdam* carried 936 passengers and 656 crew. The passengers included: 811 from the U.S.; 65 from Canada; 20 from The Netherlands; 12 from the U.K.; 9 from Australia; and 1 to 4 from Argentina, Belgium, Columbia, Germany, Israel, New Zealand, Norway, Panama, Portugal, Switzerland (Van Deursen Apr. 19, 2000).

Table 3.7. Carrying Capacity Comparison of the *Rotterdam* to the *Marco Polo* and IAATO-Member Vessels			
Vessel	*Rotterdam*	*Marco Polo*	*Hanseatic* *Clipper Adventurer*
Operator(s)	Holland America Line-Westours, Inc.	Orient Lines	Hapag-Lloyd Clipper Cruise Line Zegrahm Expeditions
IAATO Member(s)	No	No	Yes
Passenger Capacity	1,000	850	120-180
Estimated Average Load	1,000	- 500	110-150
Difference:			
Estimated Average Load		500	890-850
Percent		200%	-900-670%

From: HALW IEE 1999; Orient Lines IEE 1998, Fogelberg Oct. 4 1999; and IAATO IEE 1999.

HALW's operations for the voyage through Antarctic waters were similar to those of IAATO member operators, including U.S.-based operators, and Orient Lines as follows:

• Proposed routes and itineraries were submitted to the Department of State as part of operator's notice of intent to travel.

• The ship's crew was advised and briefed on Recommendation XVIII-1, *Guidance for Visitors to the Antarctic*, the Protocol on Environmental Protection to the Antarctic Treaty, and IAATO's Bylaws and recommendations.[49]

• Standard Operating Procedures were delineated in the Safety Management System of the ship.

• A special training module which provided officers, crew and passengers with a code of conduct to follow while in Antarctic waters was developed.[50]

• The *Rotterdam* was fitted with communications capabilities to enable coordinated communications with expedition leaders of other ships.

• Post-trip report forms were maintained and submitted to the National Science Foundation.

[49] IAATO member operators and Orient Lines maintain staff with a minimum of 75% previous Antarctic experience overall. HALW retained an Ice Pilot and Expedition Leader both with Antarctic experience.

[50] For U.S.-based IAATO members and Orient Lines, the passenger education program includes a lecture program on a code of conduct to follow while in Antarctic waters including Recommendation XVIII-1.

HALW's Initial Environmental Evaluation indicates that the itinerary for the *Rotterdam*, as listed in Table 3.8, is based on maximizing the scenic cruising experience with consideration of weather and time, and avoidance of any activity within marine protected areas.[51] The total voyage time in the Antarctic Treaty area is estimated to be 72 hours, the shortest time for a Peninsula area cruise relative to other U.S.-based ship-based operators.

Table 3.8. Proposed Peninsula Area Itinerary, *ms Rotterdam*

Location	Purpose
Enter Hope Bay at Esperanza Station	• Scenic viewing
Bransfield Strait, by Deception Island to Neymayer Channel	• Scenic viewing: Gerlache Strait, Lemaire Channel, Paradise Bay
Return through Bransfield Strait past Elephant Island	• Scenic viewing including Shackleton expedition area
	• Efficient passage north
	• Passenger interest in Shackleton expedition

From: HALW IEE 1999

In accordance with 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica," (40 CFR Part 8) HALW submitted an Initial Environmental Evaluation to the Environmental Protection Agency for the *Rotterdam* expedition undertaken during the 1999-2000 (HALW IEE 1999). HALW concluded that the proposed expedition under the described process will have no more than a minor or transitory impact on the Antarctic environment. The Environmental Protection Agency, in consultation with other interested federal agencies, concluded that HALW's Initial Environmental Evaluation met the requirements of Article 8 and Annex I of the Protocol on Environmental Protection and the provisions of 40 CFR Part 8 (Dickerson Apr. 16, 1999).[52]

[51] 'Marine protected areas' in this EIS refers to those marine areas within the Antarctic Treaty area that are or may be designated as marine protected areas under the Antarctic Treaty or related agreements. These are not the same as 'marine protected areas' under Executive Order 13158, "Marine Protected Areas," or other international treaties or U.S. domestic legislation. Executive Order 13158 applies to the 'marine environment' which means those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands thereunder, over which the United States exercises jurisdiction consistent with international law.

[52] HALW has also submitted an IEE to EPA for two similar voyages to be made during the 2001-2002 season by the *Ryndam* (HALW IEE 2000 and Montgomery May 23, 2000).

3.10. Land-Based Operations by Adventure Network International (ANI)

EPA's Final Rule will apply only to nongovernmental activities of U.S.-based operators organized in or proceeding from the U.S. to Antarctica.[53] Currently, there are no U.S.-based operators with land-based operations in Antarctica. However, the discussion of human activities in Antarctica includes an overview of the foreign-based, land-based operations of Adventure Network International (ANI) in order to fully delineate the realm of human activities in Antarctica, information that is relevant to the cumulative impacts of humans in Antarctica.

ANI is based in Canada with business offices in the United Kingdom; its expeditions are organized from the United Kingdom. ANI is the only land-based operator serving tourists and other nongovernmental expeditions to Antarctica. ANI was created in 1985 as a guided transportation system for climbers wishing to climb Vinson Massif and has supported almost every private expedition into Antarctica since this time. In 1987, the company was the first to land a wheeled aircraft in Antarctica,[54] the first to fly tourists to the South Pole in 1988, and the first to visit the Emperor Penguins at their colony on Dawson-Lambton Glacier (Sommerville 1998).

ANI uses large aircraft operating out of Punta Arenas, Chile, to carry passengers directly to its Patriot Hills camp at the southern end of the Ellsworth Mountains. Since its beginning in 1985, ANI has carried over 1,000 passengers to Antarctica. The ANI Patriot Hills camp is a six-hour flight from the southern tip of Chile and is accessible only by air. Housing 48 visitors, Patriot Hills is the only private camp operating in Antarctica. The camp has a kitchen, dining and library areas, with insulated tents for guests who use sleeping bags with cots.[55]

As an example of ANI's tourist operations, for the 1998-99 season ANI offered seven programs. These included: mountain climbing on Vinson Massif in the Ellsworth Range, the Transantarctic Mountains, and Dronning Maud Land; an Ellsworth Mountain ski safari through Horseshoe Valley to the Union Glacier and the base of the Ellsworth Mountains; private flights to the South Pole; a photo safari to the Dawson-Lambton Emperor Penguin rookery; and an expedition

[53] The Final Rule will be issued pursuant to the Antarctic Science, Tourism, and Conservation Act of 1996 and will implement the requirements of Article 8 and Annex I to the Protocol on Environmental Protection to the Antarctic Treaty of 1959.

[54] ANI first landed a DC-4 on a blue ice runway at the foot of Patriot Hills, and continued with the first wheeled landing of a DC-6 aircraft on the same runway in 1989, and the first wheeled landing of a civilian Lockheed Hercules in November 1993. The company's Twin Otters have flown more than 3,000 hours, and the ANI-owned Cessna 185 has flown more than 500 hours. By early 1997, the total distance flown over the continent by ANI aircraft exceeded 850,000 miles (Sommerville 1998).

[55] Weather at Patriot Hills varies with the seasons. Temperatures in mid-October are about -30°C (-22°F) and rise to about -5°C (23°F) in mid-December. Winds blow from the Pole to the coast at about 10-15 knots, with occasional katabatic winds gusting up to 100 knots.

which included snow-mobiling, hiking, light climbing and flight seeing. All expeditions departed for Patriot Hills from Punta Arenas, Chile, except the Dronning Maud Land mountain climbing expedition which departed from Cape Town, South Africa (Sommerville 1998).

ANI provides support for various solo and small groups trekking to/from the South Pole or other parts of the continent, including transcontinental treks. ANI has provided support for sky diving expeditions, (Washington Post Feb. 8, 1997; NY Times Dec. 8, 1997) and in 1998, ANI supported the first nongovernmental expedition to collect meteorites (Krajick 1999).

Although not an IAATO member, ANI abides by the IAATO Bylaws.[56] ANI also has an environmental policy and operational guidelines, as listed in Appendix 11, that are observed while providing and supporting aircraft and land-based, private-sector travel to and within Antarctica. Through its environmental policy and guidelines, ANI abides by the relevant provisions of the Protocol on Environmental Protection to the Antarctic Treaty and Annexes, and complies with those provisions, including ensuring that all staff and clients are properly briefed on those provisions that might affect them. Following the requirements of the Protocol on Environmental Protection to the Antarctic Treaty, ANI notifies the United Kingdom and follows British requirements for environmental impact assessment documentation and other matters associated with its Antarctic activities (Sommerville 1998 and ANI IEE 1993).

In addition to its tourist-related activities, in 1991, ANI established Polar Logistics at a base camp in Dronning Maud Land, Antarctica, to provide commercial logistical support to national science programs including cargo movement, search and rescue and medical evacuation from the continent through the availability of a Hercules C-130, the Twin Otter aircraft and skidoos. IAATO-member operators have also made arrangements with ANI for emergency evacuation of sick or injured persons (IAATO IEE 1999). The Hercules aircraft flies from South Africa to the base camp, and the Twin Otter is used to support flights to national research stations in the region and to place small groups of climbers in Fimbulheimen and Sor Rondane (Polar Logistics Brochure and Polar Logistics).

3.11. Expeditions by U.S.-Based Research Foundation, Oceanites, Inc.

Oceanites, Inc. is a U.S.-based nonprofit education and scientific foundation located near Washington, D.C. (Naveen 1996 and Oceanites IEE1997). Oceanites has conducted the Antarctic Site Inventory project since 1994 in order to develop baseline information on Peninsula area sites visited by tour ships (Naveen 1996 and Oceanites IEE 1997).[57] The project's methodology is

[56] ANI was one of the founding members of IAATO although it currently is not a member. See Appendix 7.

[57] The Antarctic Site Inventory was initiated by Oceanites, Inc., in 1994 as a two-year pilot project and was initially a U.S. government expedition since the project received grant funds from the National Science Foundation. However, since the Apr. 30, 1997 promulgation of 40 CFR Part 8, "Environmental Impact

described in the *"Compendium of Antarctic Peninsula Visitor Sites: A Report to the Governments of the United States and the United Kingdom" (Compendium)* and summarized in Table 3.9 (Naveen 1997).

Table 3.9.	**Methods Used for the Antarctic Site Inventory**
Research Teams:	2-3 two-person teams working on different platforms (tour ships)
Vessel Selection:	Tour expeditions that envisage 2-3 landings per day over a 5-7 day itinerary during which project investigators can be ashore 3-5 hours during each landing; investigators may also arrange to be landed at other nearby survey sites which are not the primary focus of that day's tourist landings
Timing of Visits:	Key times are based on collection of information regarding relevant biological parameters: early November to early December (peak penguin egg laying); and mid-January to mid-February (peak penguin chick-creching, southern fur seals may haul-out, southern elephant seals collect in wallows to molt)
Categories of Information Collected at Each Site:	1. Basic Site Information includes key physical, biological and topographical characteristics of the site
	2. Variable Site Information describes weather and other environmental conditions, particular biological parameters relating to penguins and flying birds, and the nature and extent of any observed visitor impacts
	3. *Map*s and *photo documentation* includes up-to-date maps of each site

From: Naveen 1997

During the first three austral field seasons, 1994-1997, Oceanites began characterizing and describing the flora, fauna, and other features of Antarctic Peninsula sites subject to frequent tourist visits, and compiling baseline data and information to be used to detect and assess changes in the flora, fauna, and other features of these Peninsula area sites. During the subsequent four austral seasons, 1997-2001, Oceanites continued to conduct census activities at Peninsula area sites regularly visited by tourists (Oceanites IEE 1997, Oceanites IEE 1998, Oceanites IEE 1999, and Oceanites IEE 2000).

The *Compendium* summarizes the results and findings for the first three seasons of the project, 1994 through 1997 (Naveen 1997). *Visitor Landings in the Antarctic Peninsula, 1989-99*, updates the *Compendium* and examines the 165 landing sites that tour vessels have visited in the Antarctic Peninsula during the 10-year period 1989-99 (Naveen 1999).

In accordance with 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica," Oceanites submitted Initial Environmental Evaluations to the Environmental Protection Agency for the Antarctic Site Inventory project for the expeditions undertaken during the 1997-98, 1998-99, 1999-2000, and 2000-2001 seasons (Oceanites IEE 1997, Oceanites IEE 1998, Oceanites IEE 1999, and Oceanites IEE 2000). For all four seasons, Oceanites concluded that the continuation of the Antarctic Site Inventory under the described process, will have no more than a

Assessment of Nongovernmental Activities in Antarctica," Oceanites has not received grant funds from the National Science Foundation or from other U.S. government sources for its expeditions to Antarctica, thus, Oceanites' expeditions are defined as nongovernmental expeditions [40 CFR 8.3] and are subject to the requirements of 40 CFR Part 8.

minor or transitory impact on the Antarctic environment. The Environmental Protection Agency, in consultation with other interested federal agencies, concluded that Oceanites' Initial Environmental Evaluations met the requirements of Article 8 and Annex I of the Protocol on Environmental Protection and the provisions of 40 CFR Part 8 (Dickerson Nov. 5, 1997; Dickerson Oct. 6, 1998; Dickerson Sep. 8, 1999; and Montgomery Oct. 18, 2000).

3.12. Examples of Other Nongovernmental Expeditions

3.12.1. Greenpeace International

Greenpeace International, based in The Netherlands, has campaigned to have Antarctica declared a World Park since 1983. As part of its Antarctic Expedition Program, Greenpeace established World Park Base, a small base at Cape Evans on Ross Island. Constructed during the austral summer of 1986-87, the base was decommissioned in 1991-92.[58] The base was used by Greenpeace to gain first-hand experience in operating a base and to monitor and publicize the activities of other nearby government-operated stations. Since 1990-91, Greenpeace has maintained small, independently mobile ship-based teams to monitor the implementation of the Environmental Protocol and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) (Greenpeace 1991). Greenpeace has continued its focus on whaling and illegal fishing operations in the Southern Ocean into the 1999-2000 season. On its first expedition of this season, Greenpeace pursued a four-vessel whaling fleet operated by a Japanese company in the Indian Ocean region of the Southern Ocean.[59] The second voyage focused on illegal fishing in the same general region, primarily to watch for illegal fishing of Patagonian toothfish (ANAN-11/06 Dec. 22, 1999; ANAN-12/10 Jan. 5, 2000; ANAN-19/08 Apr. 12, 2000; and ANAN-18/07 Mar. 29, 2000).

[58] As part of the base removal, Greenpeace conducted a monitoring program to evaluate the effect that World Park Base (77?38'S, 166?24'E) had on the environment since its construction in 1987. The Initial Environmental Evaluation prepared by Greenpeace for removal of the base concluded that the base operations and removal activities had no more than a minor or transitory impact on the Antarctic environment (Greenpeace 1991).

[59] Under a permit issued by the Japanese Minister of Agriculture, Forestry and Fisheries for the 1999-2000 season, the Japanese vessels could catch up to 400 Minke whales with up to 440 taken if necessary for 'research purposes.' During the season, 439 Minke whales were taken, 50 more than in 1998-1999 (ANAN-19/08 Apr. 12, 2000).

3.12.2. White Mountain Films, LLC

White Mountain Films, LLC, (WMF) is a U.S.-based company that organized a one-time expedition to Antarctica during the 1999-2000 austral season to undertake filming for two projects about Sir Ernest Shackleton and the Imperial Trans-Antarctic Expedition of 1914-16. During this expedition, filming was conducted at sea, on the edges of the ice pack, in the Elephant Island vicinity and on the island itself. The filming activity took place aboard ships, from a helicopter based on one of the ships, small inflatable boats, and on the ice and land. The 33-member film crew included seven field staff and a medic, with about 20 persons as the largest number ashore at any one time.[60] The expedition was in the Antarctic Treaty area for several weeks between November 1999 and February 2000. This was the only expedition undertaken by this U.S.-based company and no further expeditions are planned (WMF IEE 1999).

In accordance with 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica," (40 CFR Part 8) WMF submitted an Initial Environmental Evaluation to the Environmental Protection Agency for the filming expedition undertaken during the 1999-2000 season (WMF IEE 1999). WMF concluded that the planned filming expedition would have no more than a minor or transitory impact on the Antarctic environment. The Environmental Protection Agency, in consultation with other interested federal agencies, concluded that WMF's Initial Environmental Evaluation met the requirements of Article 8 and Annex I of the Protocol on Environmental Protection and the provisions of 40 CFR Part 8 (Dickerson Sep. 29, 1999).

3.13. Tourist Numbers, Landing Sites and Activities in Antarctica with a Focus on the Peninsula Area

Tourist information submitted by Antarctic tour operators has been compiled by the National Science Foundation for the 10-year period 1989-1999.[61] [62] During this time, the overall number of visitors to all of Antarctica has increased from 2,460 total visitors reported in 1989-1990 to 10,013 total visitors reported in 1998-1999, representing a 407% overall increase in the number of visitors

[60] This number does not include the ships' crew. The ships include: the *Akademik Shuleykin* chartered from Marine Expeditions, Inc., Canada, which accommodated 29 film crew and support staff; and the *Laurel* chartered from Ultragas Ltda, Chile, which accommodated four film and two helicopter crew.

[61] Beginning with the 1989-90 Antarctic tour season, the National Science Foundation has compiled information on Antarctic tourism from reports submitted by Antarctic tour operators. Reports are submitted by U.S.-based and non-U.S.-based tour operators (including IAATO and non-IAATO members), but are not necessarily submitted by yacht operators; see Section 3.6 for information on yachts. Expeditions reported on include those to both the Peninsula and Ross Sea areas.

[62] IAATO has collaborated with the National Science Foundation to ensure that all Antarctic tourist expeditions, not just those of U.S. organizers, are reported and included in the numerical summary reports maintained by the National Science Foundation (IAATO XXIII ATCM 1999).

to all of Antarctica. The 1998-1999 season was the first time there were over 10,000 visitors to Antarctica. The total visitors for each year and the percentage change from the previous year are presented in Appendix 12. These totals represent the number of visitors reported by the ship-based tour operators in a particular season, but do not distinguish between visitors onboard ships in the Peninsula and Ross Sea areas (Naveen 1999). The five countries with the largest number of its citizens traveling to Antarctica are: the United States (41.0%), Germany (13.4%), the United Kingdom (7.8%), Australia (7.1%), and Japan (5.6%) (IAATO XXII ATCM/IP 1998 and IAATO ATCM/IP98 1999).[63]

3.13.1. Land-Based vs. Ship-Based Tourism and Ross Sea vs. Peninsula Area Tourism

The majority of nongovernmental activities in Antarctica occur as ship-based tourism. Table 3.11 lists the number of land-based expedition participants and the number of ship-based tourists to all of Antarctica for the eight-season period, 1992 through 2000.[64] On average, 98.7% of all Antarctic tourists are ship-based while only 1.3% are land-based.

Table 3.11. Percentage of Land-Based Tourists by Season

	Land-Based Tourists	Ship-Based Tourists	Total Tourists	%Land-Based Tourists
1992-93	127	6,577	6,704	1.9%
1993-94	59	7,957	8,016	0.7%
1994-95	120	8,090	8,120	1.5%
1995-96	155	9,212	9,367	1.7%
1996-97	91	7,322	7,413	1.2%
1997-98	171	9,473	9,604	1.4%
1998-99	79	9,934	10,013	0.8%
1999-2000 (Estimates)	200	14,065	14,265	1.4%
Average:				1.3%

From: IAATO IEE 2000, IAATO IEE 1999, IAATO IEE 1998, and IAATO IEE 1997

[63] For the 1994-95, 1995-96, 1996-97 and 1997-98 seasons, the average percent of the totals by nationality are listed in parentheses. During this same period, other nationalities averaged as follows: Switzerland (2.6%), Canada (2.5%), Argentina (2.0%), France (1.4%), Austria and Brazil (1.1%), Others (8.4%) and Unknown (5.8%); % discrepancies due to rounding.

[64] This includes the time period that EPA's Interim Final Rule at 40 CFR Part 8 has been in effect; e.g., the 1997-98, 1998-99 and 1999-2000 austral seasons. The passenger estimates are from IAATO's Preliminary Estimate of Antarctic Tourism submitted with each year's Initial Environmental Evaluation; See: Appendix 14.

As noted in Section 3.6, the majority of ship-based tourism in Antarctica occurs in the Peninsula area. Beginning with the 1992-93 season, the tour operators began reporting landing information to the National Science Foundation for the Peninsula and Ross Sea areas. From this information, in 1992-93, nearly 89% of the tourist landings were in the Peninsula area, and for the six-year period from 1993-1999, 95-98% of the landings were in the Peninsula area (Naveen 1999). Appendix 13 lists for each year the total number of reported landings, the number of landings in the Peninsula and Ross Sea areas, and the percentage of the total landings that are in the Peninsula area. The figures in Appendix 14 summarize Antarctic tourism during the three austral seasons, 1997-2000,[65] and confirm that, on average, during these three seasons 95% of the expeditions and 96% of the passengers traveled to the Peninsula area while only 5% of the expeditions and 4% of the passengers traveled to the Ross Sea area.

3.13.2 Tourist Numbers, Landing Sites and Activities in the Peninsula Area

Based on information reported by tour operators to the National Science Foundation, Naveen (1999) analyzed the location and frequency of tourists coming ashore by Zodiac annually in the Peninsula area. A total of 165 Peninsula area sites were identified where visitors made Zodiac landings during the 10-year period, 1989-1999.[66] The geographical distribution of visitor landings in the Peninsula area has been relatively consistent throughout the 10-year period, 1989-1999. Most visits occur in the South Shetland Islands (about 43% of all landings) and the northwestern part of the Peninsula (about 36% of all landings). Over the 10-year period, landings on the southwest Peninsula have been about 10% of all landings, and on the northeast Peninsula about 7-8% of all landings. Naveen (1999) also analyzed the annual number of visitors to these landing sites. During each of the seasons within the 10-year period, 1989-1999, the ten sites with the most number of landings consistently accounted for more than 55% of that season's landings and about 51% of that season's visitors. The twenty sites with the most number of landings consistently accounted for more than 75% of that season's landings and about 77% of that season's visitors (Naveen 1999).

During this 10-year period, the number of annual Zodiac landings increased from 164 to 858, representing an increase of 523%. For the same 10-year period, the number of annual tour passenger visitors increased from 17,759 to 74,772, representing an increase of 421%. Appendix 15 lists the total number of Peninsula area landings and visitors by season and the percentage change from the preceding season for each.

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[65] This covers the time period that EPA's Interim Final Rule at 40 CFR Part 8 has been in effect for U.S.-based operators; e.g., the 1997-98, 1998-99 and 1999-2000 austral seasons. The passenger estimates are from IAATO's Preliminary Estimates of Antarctic Tourism submitted with each years' Initial Environmental Evaluation.

[66] The National Science Foundation compilation lists more than 250 sites in the Antarctic Peninsula, Queen Maud Land, South Georgia and Falklands Islands regions. The Antarctic Treaty area, the area south of 60° south latitude, excludes areas such as South Georgia and the Falkland Islands; thus these sites were not included in Naveen's analysis (Naveen 1999).

With regard to landings in the Peninsula area during the 10-year period 1989-1999, even with decreases in three of the seasons, the number of landings per year increased on average by 77 with an average increase of 81 between the years in the first four seasons (1989-1994) and an average increase of 149 between the years in the next five seasons (1994-1999). The greatest increase in number of landings, +216, occurred between the 1993-1994 and 1994-1995 seasons, while the greatest decrease in the number of landings, -61, occurred between the 1996-1997 and 1997-1998 seasons. With regard to the number of visitors to Peninsula area landing sites during this same 10-year period, even with decreases in two of the seasons, the number of visitors at landing sites increased on average by 6,332. Thus, there was an average increase of 8,069 between the years in the first four seasons, and an average increase of 4,934 between the years in the next five seasons. The greatest increase in number of visitors to landing sites, +22,246, occurred between the 1992-1993 and 1993-1994 seasons, while the greatest decrease in the number of visitors to landing sites, -11,039, occurred between the 1991-1992 and 1992-1993 seasons.

Naveen (1999) identified the most heavily visited Peninsula area sites according to the number of annual landings and visitors for the five-year period 1989-94, the next five-year period 1994-99, and for the total 10-year period 1989-99. Table 3.12 lists the 16 sites with 100 or more annual landings for the 10-year period 1989-99, and their relative rank for the first and second five-year periods and the total 10-year period.

Table 3.12. Peninsula Area Sites with 100 or More Landings, 1989-999

Site	1989-99 LDGS	1989-99 LDGS Rank	1989-94 LDGS Rank	1994-99 LDGS Rank
Whalers Bay, Deception Island	425	1	1	1
Cuverville Island	359	2	4	2
Port Lockroy, Wiencke Island	350	3	5	3
Pendulum Cove, Deception Island	300	4	3	5
Hannah Point, Livingston Island	290	5	8	4
Petermann Island	278	6	6 Tied	6
Half Moon Island	263	7	6 Tied	7
Almirante Brown Station, Paradise Bay	259	8	2	8
Paulet Island	196	9	11	10
Arctowski Station, King George Island	166	10	10	13
Neko Harbor, Andvord Bay	152	11	—	9
Baily Head, Deception Island	149	12	13	12
Waterboat Point (G.Videla Station), Paradise Bay	148	13	9	16

Table 3.12. Peninsula Area Sites with 100 or More Landings, 1989-999				
Site	**1989-99 LDGS**	**1989-99 LDGS Rank**	**1989-94 LDGS Rank**	**1994-99 LDGS Rank**
Aitcho Islands	147	14	—	11
Penguin Island	118	15	18	14
Palmer Station, Anvers Island	104	16	12	19 Tied

From: Naveen 1999

For these 16 sites with 100 or more annual landings, Whalers Bay has consistently been the most heavily visited site for both the first and second five-year periods and throughout the 10-year period. Other sites with little or no change in their landings rank are: Petermann Island, Half Moon Island, Arctowski Station on King George Island, and Baily Head including Rancho Point on Deception Island (ranked 6th, 7th, 9th and 12th, respectively, for the 10-year period).

An increase in rank of 2 to 4 occurred over the 10-year period for Cuverville Island, Port Lockroy (including Jougla Point) on Wiencke Island, Hannah Point on Livingston Island, and Penguin Island. More notable, two sites, Neko Harbor in Andvord Bay and Aitcho Islands, were not ranked in the top 25 most landed sites for the first five-year period (Naveen 1999). However, the intensity of landings during the second five-year period raised their landing rank during this period to 9th and 11th, respectively, and for the 10-year period to 11th and 14th, respectively.

A decrease in rank of 2 to 3 occurred over the 10-year period for Pendulum Cove on Deception Island and Arctowski Station on King George Island. More notable, three sites, Almirante Brown Station at Paradise Bay, Waterboat Point including G. Videla Station at Paradise Bay, and Palmer Station on Anvers Island, dropped 6 to 7 rankings from the first five-year period to the second five-year period. All three continue to have more than 100 annual landings and for the 10-year period are ranked 8th, 13th and 16th, respectively.

Table 3.13 lists the number of sites with 100 or more annual landings for the first and second five-year periods and the total for the 10-year period, and illustrates how the number of sites with 100 or more annual lands rose during the second five-year period, 1994-99. During the second five-year period, Whalers Bay went from over 100 annual landings to over 300 annual landings so that Whalers Bay had over 400 landings during the 10-year period, 1989-99. Similarly, during the second five-year period, over 200 annual landings occurred at five sites (Cuverville Island, Port Lockroy, Hannah Point, Pendulum Cove, and Petermann Island), so that Cuverville Island, Port Lockroy, and Pendulum Cover each had over 300 landings during the 10-year period. The same increase pattern occurred such that, over the 10-year period, over 200 annual landings occurred at four sites (Hannah Point, Petermann Island, Half Moon Island, and Almirante Brown Station), and over 100 annual landings occurred at eight sites (Paulet Island, Arctowski Station, Neko Harbor, Baily Head, Waterboat Point, Aitcho Islands, Penguin Island, and Palmer Station).

Table 3.13. Number of Sites with 100 or More Annual Landings for 1989-94, 1994-99 and 1989-99			
Number of Sites with:	**1st 5-Years 1989-94**	**2nd 5-Years 1994-99**	**10-Years 1989-99**
400 or more landings	0	0	1
300 or more landings	0	1	3
200 or more landings	0	5	4
100 or more landings	2	6	8
Total sites with 100 or more landings	2	12	16

From: Naveen 1999

In addition to the location and frequency of tourist visitors coming ashore by Zodiac landing during the 1989-99 period, Naveen also analyzed the number of visitors at the 165 Peninsula area sites, including identification of the most heavily visited sites according to the number of annual visitors for the first and second five-year periods and for the total 10-year period, 1989-99. Table 3.14 lists 17 sites with 9,000 or more visitors. These sites include the 16 sites with 100 or more annual landings for the 10-year period 1989-99 with the addition of Esperanza Station at Hope Bay, ranked 19th by number of annual landings. Table 3.14 also lists the visitor ranking for these 17 sites for the first and second five-year periods and the total 10-year period.

Table 3.14. Peninsula Area Sites with 9,000 or More Visiting Tourist Passengers, 1989-1999				
Site	**1989-99 PAX**	**1989-99 PAX Rank**	**1989-94 PAX Rank**	**1994-99 PAX Rank**
Whalers Bay, Deception Island	35,325	1	1	1
Port Lockroy, Wiencke Island	34,189	2	2	2
Half Moon Island	28,541	3	5	4
Cuverville Island	27,801	4	7	3
Pendulum Cove, Deception Island	26,030	5	6	6
Hannah Point, Livingston Island	24,444	6	10	6
Petermann Island	24,082	7	8	7
Almirante Brown Station, Paradise Bay	22,381	8	3	9
Waterboat Point (G.Videla Station), Paradise Bay	21,735	9	4	10
Paulet Island	18,809	10	11	8
Arctowski Station, King George Island	14,750	11	9	14
Baily Head, Deception Island	12,176	12	14	13
Aitcho Islands	11,219	13	—	11
Palmer Station, Anvers Island	10,790	14	12	18
Hope Bay, Esperanza Station	9,897	15	13	17

Table 3.14. Peninsula Area Sites with 9,000 or More Visiting Tourist Passengers, 1989-1999				
Site	**1989-99 PAX**	**1989-99 PAX Rank**	**1989-94 PAX Rank**	**1994-99 PAX Rank**
Neko Harbor, Andvord Bay	9,853	16	—	12
Penguin Island	9,362	17	20	15

From: Naveen 1999

For these 17 sites with 9,000 or more annual visitors, Whalers Bay has consistently been the most heavily visited site with Port Lockroy (including Jougla Point) on Wiencke Island as the second most visited site for both the first and second five-year periods and throughout the 10-year period. Other sites with little or no change in their visiting passenger rank are: Half Moon Island, Pendulum Cove on Deception Island, Petermann Island, and Baily Head including Rancho Point on Deception Island (ranked 3rd, 5th, 7th and 12th, respectively).

An increase in rank of 3 to 5 occurred over the 10-year period for Cuverville Island, Hannah Point on Livingston Island, Arctowski Station on King George Island, and Penguin Island. More notable, two sites, the Aitcho Islands and Neko Harbor in Andvord Bay, were not ranked in the top 25 most visited sites for the first five-year period (Naveen 1999). However, the intensity of visiting tourists during the second five-year period raised their passenger visitor rank during this period to 11th and 12th, respectively, and for the 10-year period to 13th and 16th, respectively.

A notable decrease in rank of 4 to 6 occurred over the 10-year period for five sites from the first five-year period to the second five-year period: Almirante Brown Station at Paradise Bay, Waterboat Point including G. Videla Station at Paradise Bay, Arctowski Station on King George Island, Palmer Station on Anvers Island, and Esperanza Station at Hope Bay. All five continue to have more than 9,000 passengers visiting annually and for the 10-year period are ranked 8th, 9th, 11th, 14th, and 15th, respectively.

Table 3.15 lists the number of sites with 9,000 or more annual visitors for the first and second five-year periods and the total for the 10-year period, and illustrates how the number of sites with 9,000 or more annual visitors rose during the second five-year period, 1994-99 as follows:

- During the second five-year period, Whalers Bay and Port Lockroy went from over 10,000 annual visitors to over 20,000 annual visitors so that Whalers Bay had over 30,000 visitors during the 10-year period, 1989-99.

- For the seven sites with 20,000 or more total visitors during the 10-year period, Almirante Brown Station and Waterboat Point (with Gonzales Videla Station) remained at about 10,000-11,000 for both the first and second five-year periods; however, the other five sites went from the 6,000-9,000 range up to the 12,000-19,000 visitor range. The seven sites with 20,000 or more visitors for the 10-year period include: Half Moon Island, Cuverville Island,

Pendulum Cove, Hannah Point, Petermann Island, Almirante Brown Station, and Waterboat Point.

• The number of sites with 10,000 or more annual visitors doubled from four in the 1989-94 period to eight in the 1994-1999 period. Of these, the five sites with 10,000 or more visitors during the 10-year period include: Paulet Island, Arctowski Station, Baily Head, Aitcho Islands, and Palmer Station. Visitors at these sites rose in range from fewer than 3,000-6,000 visitors up to the 5,000-12,000 visitor range.

• During the first five-year period, only Half Moon Island had over 9,000 visitors. During the second five-year period, Half Moon Island increased to over 18,000 visitors moving it to the 20,000 range for the 10-year period, and two new sites, the Aitcho Islands and Neko Harbor, rose from fewer than 1,000 visitors in the first five-year period to over 9,000 annual visitors in the second five-year period. These two sites, and Hope Bay, totaled 9,000 or more visitors for the 10-year period.

Table 3.15. Number of Sites with 9,000 or More Annual Passengers (PAX) for 1989-94, 1994-99, and 1989-99

Number of Sites with:	1st 5-Years 1989-94	2nd 5-Years 1994-99	10-Years 1989-99
30,000 or more PAX	0	0	2
20,000 or more PAX	0	2	7
10,000 or more PAX	4	8	5
9,000 or more PAX	1	2	3
Total sites with 9,000 or more PAX	5	12	17

From: Naveen 1999

As seen in Tables 3.12 and 3.14, and summarized in Table 3.16, there were more than 250 landings and more than 20,000 visiting passengers[67] at the top eight ranked sites for the 10-year period, 1989-99. With regard to these sites and this 10-year period, the *Marco Polo*, which carries more than 400 passengers, was the largest tour vessel with passengers going ashore (see Section 3.9.1).[68] Of the Peninsula area sites included in the landing itinerary for the *Marco Polo*, three of these sites are in the top eight ranked sites for both the number of landings and the number of annual visitors (Orient Lines IEE 1998 and Orient Lines IEE 2000).

[67] Waterboat Point (Gonzales Videla Station), Paradise Bay, was the only other site with more than 20,000 visitors during the 1989-99 10-year period. During this time, this site had 148 landings.

[68] The *Rotterdam*, with 1,000 passengers is larger than the *Marco Polo*. However, the *Rotterdam* expedition consists solely of transiting Antarctic waters without passengers going ashore. By comparison, the largest IAATO-member vessel, the *Hanseatic*, carries 150 passengers with onshore visits.

Table 3.16. Top 8 Ranked Peninsula Area Sites: Number of Landings and Number of Annual Visitors			
Site	**On Itinerary of Marco Polo**	**Rank by LDGS**	**Rank by PAX**
Whalers Bay, Deception Island	(Yes)[69]	1/425	1/35,325
Cuverville Island		2/359	4/27,801
Port Lockroy, Wiencke Island	Yes	3/350	2/34,189
Pendulum Cove, Deception Island	Yes	4/300	5/26,030
Hannah Point, Livingston Island		5/290	6/24,444
Petermann Island		6/278	7/24,082
Half Moon Island	Yes	7/263	3/28,541
Almirante Brown Station, Paradise Bay		8/259	8/22,381

From: Naveen 1999

Naveen's 1999 analysis of the 165 Peninsula area sites shows that during every season Zodiac landings of tourists are made at new sites in the Antarctic Peninsula area with the addition of new sites reaching a peak in the three seasons between 1994 and 1997. Table 3.17 lists, by season, the number of sites where Zodiac landings occurred for the first time and the percentage of all Peninsula area sites with Zodiac landings during that season. For this compilation, the 1989-90 season is considered the "base." The 35 sites visited in the base season, 1989-90, are listed in Appendix 16 along with the number of landings at each site for the 10-year period 1989-90.

Table 3.17. Zodiac Landings Occurring for the First Time in the Peninsula Area		
Season	**No. Sites Where Zodiac Landings Occurred for First Time**	**% of All Peninsula Area Sites With Zodiac Landings that Season**
1989-90	35	100.0%
1990-91	7	21.9%
1991-92	12	27.3%
1992-93	14	28.0%
1993-94	16	25.0%
1994-95	21	28.0%
1995-96	19	26.8%
1996-97	18	22.2%
1997-98	11	15.5%
1998-99	12	14.1%

From: Naveen 1999

[69] Whalers Bay was included as a landing site through the 1999-2000 season; beginning in 2000-2001, the *Marco Polo* will land at Pendulum Cove rather than Whalers Bay (Orient Lines IEE 2000).

Setting aside the 35 Zodiac landings in the 1989-90 "base" year, the number of new landing sites added for the period 1990-94 increases annually with an average for this first four-year period of 12 new sites per year. The average number of new landing sites added per year for the second five-year period, 1994-1999, is 16 sites. However, during this second five-year period, the actual numbers decrease from an all-time high of 21 new sites to the previous four-year period average of 12. Over the total nine-year period (excluding the 1989-1990 base year), there was an increasing trend through the 1994-1995 season then a decreasing trend through 1997-1998; the overall average for the number of new landing sites added for the total nine-year period is 14 sites per year. Not all sites that have had previous landings are visited each year.

Many Peninsula area sites are visited by Zodiac landings only once a season. On average, for the 10-year period 1989-99, this occurred at about 31% of the visited Peninsula area sites; during the first five-year period, this occurred on average at about 29% of the visited sites, and for the second five-year period, this increased somewhat to about 34% of the visited sites (Naveen 1999).

Tour operators have also reported on activities other than landings in the Antarctic Peninsula area. These are listed in Appendix 17 and include: Zodiac tours without landings (28 locations), helicopter landings (two sites) and helicopter overflights (three sites), snorkeling and scuba activities (seven sites), and ice walking (one site) (Naveen 1999).[70]

3.13.3. Summary of the 1999-2000 'Millennium' Season

The 1999-2000 austral season set records for the number of tourists and the number of large tour vessels. In addition to the usual ship-based and land-based expeditions, the season also included some unique, and first-time, activities.

For the 1999-2000 season, Argentina's Tourism Board of Terra del Fuego anticipated 114 voyages from the Port of Ushuaia by 19 tour vessels with total passenger capacity in excess of 13,700 for departures and 12,500 for arrivals as compared to 93 voyages by 14 tour vessels with a total of 9,139 Antarctic passengers for the 1998-99 season (XXII ATCM IP/116 1998). These figures represent increases of 22% in the number of voyages, 36% in the number of tour vessels, and 37%

[70] Ship-based tour operators do not normally include camping as part of their expeditions. However, the operator reports for the 10-year period, 1989-1999, include camping activities at seven sites. These may have been included in reports submitted by yacht operators.

in the number of passengers, respectively.[71] The 'millennium factor' may have contributed to some of this increase.[72]

Four vessels conducted six voyages to the Ross Sea region with a combined passenger capacity estimated at 850. Due to ice conditions, less than a third of the passengers were estimated to have gone ashore. The ships and operators included: *Kapitan Khlebnikov* (Quark and Zegrahm Expeditions, U.S., two voyages); *Akademic Shokalskyi* (Heritage Expeditions, New Zealand, two voyages); *Marco Polo* (Orient Lines, U.S., one voyage); and *Lyubov Orlova* (Marine Expeditions, Canada, one voyage). The *Marco Polo* and *Lyubov Orlova* included the Ross Sea region as part of semi-circumnavigations of the continent (ANAN-5/01 Sep. 29, 1999 and Biggs Feb. 2, 2000).

The record number of nongovernmental ships, yachts and aircraft supported a wide range of tourist and adventure-related activities including: general sightseeing, shore visits, wildlife watching, running,[73] camping, trekking, climbing, skiing, snowboarding, kayaking,[74] wind surfing, overflights, wintering over,[75] and for the first time, SCUBA diving[76] and an organized reconnaissance of surfing

[71] Argentina's Tourism Board of Terra del Fuego (TBTF) estimates that almost 50,000 Antarctic tourists, or 83% of all Antarctic ship-borne tourists, have passed through Ushuaia in the past seven years. TBTF reports the average ship passenger loading on voyages from Ushuaia over the last seven years has been around 82% (78% in 1998-99). IAATO estimates similar loadings for the 1999-2000 season indicating that between 10,200 and 11,300 passengers will pass through Ushuaia in 1999-2000. The ship-load factor would need to fall to about 70% if the 1998-99 numbers are not to be exceeded (ANAN-5/02 Sep. 29, 1999).

[72] Argentina's Tourism Board of Terra del Fuego in Ushuaia indicated that over 3,000 people, including 2,400 tourists and 700 crew, celebrated the Millennium New Years onboard some 16 tour vessels in the Peninsula Area. In the Ross Sea area, about 100 tourists were onboard a single ship, and an overflight carried 373 passengers and crew. In the interior of the continent, nearly 100 people were engaged in various nongovernmental activities through expeditions organized by ANI or the 'Millennium Expedition.' (ANAN-12/01 Jan. 5, 2000)

[73] Marine Expeditions, Inc., (Canada) organized the 4th Antarctic Marathon and half-Marathon on King George Island; about 100 persons participated (ANAN-18/03 Mar. 29, 2000).

[74] Aurora Expeditions (Australia) offered sea kayaking on two of its Peninsula Area expeditions; only 6-10 of the passengers participated in this activity (ANAN-9/04 Nov. 24, 1999)

[75] McIntyre Marine (Australia) has a small overwintering facility at Commonwealth Bay, George V Land. Two Australians spent the year at the facility. An Australian also wintered on his yacht at Port Lockroy. From: "'Spirit of Sydney' to Depart for Commonwealth Bay." (ANAN-10/06 Dec. 8, 1999 and ANAN-11/13 Dec. 22, 1999).

[76] Aurora Expeditions (Australia) offered SCUBA diving for tourists for the first time during the 1998-1999 season. Twenty-four people participated during an expedition to the Peninsula Area. (ANAN-8/08 Nov. 10, 1999).

locations.[77] In addition, Oceanites continued with its nongovernmental research in the Peninsula area[78] (Oceanites IEE 1999), and Greenpeace International continued its whaling- and fishing-related (ANAN-19/08 Apr. 12, 2000) activities (ANAN-17/01 Mar. 15, 2000; ANAN-10/05 Dec. 8, 1999; and ANAN-18/04 Mar. 29, 2000).

For the ship-based expeditions, as with previous seasons, an estimated 95% of the 1999-2000 voyages originated from Ushuaia and operated in the Peninsula area with the remainder from New Zealand and Australia to the Ross Sea area. No tourist voyages occurred in the Indian Ocean or East Antarctic sector. At least 17-18 vessels were scheduled to be in the Peninsula Area for the 'Millennium' New Year celebration (ANAN-7/02 Oct. 27, 1999).

Of the 19 Antarctic tour vessels operating out of Ushuaia during 1999-2000, eight carried 100 passengers or less; seven carried between 101-299 passengers; and four large ships carried over 300 passengers, the most 'large' vessels to tour Antarctic waters in a single season. The four large ships included: the Canadian-based World Cruise Company's *Aegean I* and *Ocean Explorer I*; HALW's *Rotterdam*; and Orient Line's *Marco Polo*. The first three of these large ships were on world cruises and used Ushuaia as the staging port for the Antarctic leg of their voyages.

The activities of the IAATO-member small vessel operators, including the U.S.-based operators, were typical of those of previous seasons (see Section 3.8). For the large vessels, U.S.-based Orient Lines operated the *Marco Polo* in Antarctic waters as it has for several seasons (see Section 3.9.1). U.S.-based HALW's operation of the *Rotterdam*, the largest tour vessel to ever traverse Antarctic waters, was unique in that this was the first Antarctic voyage for the vessel, and the activities involved cruising only with no passengers going ashore (see Section 3.9.2). The Canadian-based World Cruise Company's four expeditions were the first with its two vessels. The expedition activities included a total of three passenger landings of about 1,300 total passengers at two locations in the South Shetland Islands area. The *Aegean I* passengers landed at Half Moon Island and the *Ocean Explorer I* had a single passenger landing at Arctowski Station on King George Island. In a unique tour operator undertaking in Antarctic waters, the *Ocean Explorer I* met at Deception Island with three vessels of sister company and IAATO-member Marine Expeditions and undertook a passenger transfer of some of the passengers, with the *Ocean Explorer I* returning to Ushuaia and the three smaller vessels continuing with touring in the Peninsula area (ANAN-17/07 Mar. 15, 2000).[79]

[77] Jeremy Poncent (UK/Falkland Islands) organized an expedition aboard the yacht, *Golden Fleece*, for eight surfers affiliated with the U.S.-based Surfer's Medical Association. The group found good surfing conditions at only two locations in the Peninsula Area, Harmony Point and Low Island (ANAN-21/03 May 10, 2000).

[78] The U.S.-based Oceanites completed its sixth season of the Site Inventory Project (see: Section 3.11) with continued collection of baseline data at tourist landing sites in the Peninsula Area.

[79] The World Cruise Company contracted with IAATO-member Marine Expeditions and employed the process used by IAATO-member operators during the passenger landings (World Cruise Co. IEE 1999).

The continental expeditions and activities were supported primarily by ANI but also included the activities associated with the one-time Russian-based 'Millennium Expedition.' These expeditions resulted in a record number of persons with activities originating at Patriot Hills and with an estimated 80 to 90 tourists and adventurers arriving at the South Geographic Pole, the busiest season of nongovernmental activity ever at the Pole. Activities associated with ANI-sponsored continental expeditions were typical of its operations (see Section 3.10) and included: mountaineering, snowboarding, skiing, wildlife visits including visits to Emperor penguin colonies along the coast of the Weddell Sea, meteorite collecting,[80] various solo and small group traverses to the South Geographic Pole and beyond, and flights to the South Geographic Pole. 'Millennium Expedition' activities at Patriot Hills and the South Geographic Pole included: sky diving by 32 persons, 'snow bug' vehicle traverse to the South Geographic Pole by 15 persons, and hot air ballooning in two balloons in the vicinity of the Pole (ANAN-9/01 Nov. 24, 1999; ANAN-18/04 Mar. 29, 2000; ANAN-12/02 Jan. 5, 2000; ANAN-12/03 Jan. 5, 2000; and ANAN-17/01 Mar. 15, 2000).[81]

Qantas Airways Ltd. in conjunction with Croydon Travel Centre (Australia), completed its sixth season of continental overflights with nine flights carrying about 3,500 passengers for a total of 52 flights (see Section 3.6). Since recommencing this service in 1994, about 17,500 passengers have now participated in these continental overflights. The Chilean airline, La Linea Aerea de la Patagonia (DAP), operated from Punta Arenas, Chile, to King George Island primarily transporting national program personnel and limited cargo. As with previous seasons, DAP offered available seats to tourists providing passengers with an opportunity for an overnight stay at the Presidente Eduardo Frei complex or an extended excursion via yacht or ski-equipped aircraft from Frei to other parts of the Peninsula area (see Section 3.6). Unique to the 1999-2000 season, four private tourists flew from Punta Arenas, Chile, to Presidente Eduardo Frei Station and from there engaged in overflights of various areas in the Peninsula region (ANAN-7/04 Oct. 27, 1999; ANAN-17/03 Mar. 15, 2000; ANAN-16/05 Mar. 1, 2000; and ANAN-12/07 Jan. 5, 2000).[82]

[80] ANI organized a meteorite collection project and visit to the South Geographic Pole for the Planetary Studies Foundation, a U.S.-based private, non-profit educational organization established in 1989, whose aim is to involve students in the study of planetary science and astronomy including direct internet access of its field programs. Most of the Foundation's 200 members are from the U.S. with others from Australia, Canada, France, Germany, New Zealand and the United Kingdom. (ANAN-18/04 Mar. 29, 2000).

[81] Although more than 30 persons planned to traverse to the South Geographic Pole on the snow bugs, only 15 completed this part of the expedition. From: http://www.newzeal.com/theme/antarctic/mil2000.htm.

[82] To celebrate the millennium, Qantas was given approval by Australian authorities to use a new overflight route designed to provide passengers on the December 31st flight with the opportunity to greet the Year 2000 over the International Date Line high above the Ross Ice Shelf. (ANAN-7/04 Oct. 27, 1999).

3.14. Antarctic Tourism Trends and Out-Year Projections

3.14.1. Antarctic Tourism Trends Including Ship/Land-Based and Peninsula/Ross Sea Area Tourism

Antarctic tourism, particularly in the Peninsula area, has been increasing over the past 10 years.[83] The information for the 10-year period, 1989-1999, shows the overall number of visitors to all of Antarctica increased by 407% from 2,460 to 10,013. For the Peninsula area, the number of annual tourists increased 421% from 17,759 to 74,772. During this time, Zodiac landings increased 523% from 164 to 858 with landings made at 165 Peninsula area sites.[84] The 1998-1999 season was the first time there were over 10,000 total visitors to Antarctica, and during the 1999-2000 "Millennium Year" season, a record 14,762 ship-based tourists traveled to Antarctica, up nearly 5,000 from the previous season representing nearly a 50% increase over the numbers reported for the 1998-99 season (IAATO IEE 2000 and IAATO SATCM/IP 2000).

Information on Antarctic tourism for the three austral seasons, 1997-98 through 1999-2000, is summarized in Appendix 15.[85] During this period, the number of tourists participating in ship-based expeditions averaged nearly 99%, with land-based expeditions averaging just over 1% of the total Antarctic tourists. The Peninsula area received 95% of the ship-based expeditions and 96% of the tourists, while the Ross Sea area averaged 5% of the expeditions and 4% of the tourists.[86] [87]

Some of the record number of Antarctic ship-borne tourists during the 1999-2000 season may be attributable to the 'millennium factor' and, as IAATO has suggested, some companies were possibly testing the market with this event (Landau Sep. 25, 1999). However, cruise holidays are reported by the World Tourism Organization to be the fastest growing sector of world tourism (World Tourism Org. 1998), and consistent with this, IAATO projects an overall growth of 11%

[83] The National Science Foundation has been compiling information on the numbers of tourists and landings, as reported by the tour operators, beginning with the 1989-90 season.

[84] On average, 14 new landing sites are added per year but not all sites that have had previous landings are visited each year.

[85] This represents the time since the Environmental Protection Agency's interim final rule at 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica," was promulgated and has been in effect.

[86] The number of tourists visiting the Ross Sea area has been decreasing over the past three seasons from 8% in 1997-98 to 4% for the 1998-99 season and an estimated 3% for the 1999-2000 season.

[87] During the three-year period 1997-2000, yachts have carried about 1% of the total number of tourists and have averaged 14% of the total voyages in the Peninsula area (see Appendix 14).

during the five-year period from 2001-02 to 2004-05 (IAATO IEE 1999).[88] IAATO believes that the economic carrying capacity of the Antarctic tourism market is not known and its forecast is a "best estimate of what ... could happen" (Landau Sep. 25, 1999).[89]

IAATO's most recent five-year forecast for ship-borne Antarctic tourism is summarized in Appendix 18 (IAATO SATCM/IP 2000). IAATO projects 16,000 passengers landing by the 2004-05 season. If IAATO's passenger projections are reasonable and if 'actual' tourist numbers are 85% of the forecast (as calculated in Appendix 18), then the low forecast projection would be 13,600 passengers landing by the 2004-05 season. Likewise, if IAATO's forecasted 14,175 for the 2000-01 season is reasonable and if the rate of passengers landing increases 8 to 9% per year, then the high forecast projection would be 19,650 passengers landing by the 2004-05 season.

3.14.2. Ship-Based Tourism

Ship-based tourism is expected to continue to be conducted primarily by IAATO-member operators aboard small vessels.[90] Since its founding in 1991, IAATO has grown from seven members to 19 Full and Provisional members and 10 Associate members based in 10 countries.[91] Of these, eight are U.S.-based operators, including the three new U.S.-based operators added since the 1997-98 season[92] [93] (see Section 3.7). The present IAATO membership represents a 414% increase over nearly a 10-year period. The three new U.S.-based operators represent an increase of 38% in the total number of U.S.-based IAATO-member operators and 16% of the Full/Provisional members of IAATO.

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[88] IAATO's projected increase follows an anticipated 4% decrease in tourist numbers from the 'millennium year' high of 14,762 to a projected 14,175 for the 2001-02 season.

[89] IAATO reported that all ships and trips for the 1999-2000 season were not full even considering the millennium, and that future oil prices could effect a number of ships and trips due to the great distances ships must travel to reposition to Antarctica (Landau Sep. 25, 1999).

[90] During the 1996-1997 season, all 13 tour vessels were operated by IAATO members, and during the 1998-1999 season, IAATO members operated all but one of the vessels. (IAATO 1997 and IAATO XXIII ATCM 1999).

[91] IAATO Membership Directory 1999-2000 (Landau Jun. 3, 2000).

[92] EPA's Interim Final Rule at 40 CFR Part 8 was in effect for the first time for the 1997-98 austral season.

[93] U.S.-based Expeditions, Inc., became a Provisional (New) Member in 1999, but moved to the Associate Member category when the company did not operate in Antarctica during the 1999-2000 season as planned; U.S.-based Cheesemans' Ecology Safaris became a Provisional member in 2000 and IAATO included the company in the U.S.-based IAATO-member Intial Environmental Evaluation for expeditions for the 2000-2001 season (Landau Jun. 3, 2000; Biggs Jun. 16, 2000; and IAATO IEE 2000).

During the three-year period 1997-98 through 1999-2000,[94] U.S.-based operators conducted about 42% of the ship-based Peninsula area expeditions and carried about 54% of the tourists; Orient Lines accounts for about 9% of these expeditions with the *Marco Polo* carrying about 63% of the tourists on these expeditions (see Appendix 14).[95] U.S.-based operators are likely to continue to be 40% to 50% of the IAATO membership and to carry 50% or more of the U.S. citizen tourists.

IAATO members, including U.S.-based members, are projected to continue at approximately the same levels as the 2000-01 season for the next five years (IAATO IEE 2000). [96] Thus, any significant increases in the number of voyages and passengers in the out-years would likely be due to one or more new large vessel operators entering the market and/or increases in the number of large vessel (e.g., the *Marco Polo* or a comparable vessel) expeditions by operators already in the Antarctic tour market.[97] However, significant increases could also occur if additional new small vessel operators[98] enter the market and offer multiple annual expeditions, or if current IAATO-member operators increase their annual operations. Although yachts carry only about 1-2% of the total ship-

[94] This represents the time since the Environmental Protection Agency's interim final rule at 40 CFR Part 8, "Environmental Impact Assessment of Nongovernmental Activities in Antarctica," was promulgated and has been in effect.

[95] Clipper Cruise Line and Special Expeditions initiated expeditions during the 1998-99 season. Expeditions, Inc., had planned to initiate expeditions during the 1999-2000 season but did not. Cheesemans' Ecology Safaris did not operate expeditions to Antarctica during 1999-2000 but plans to initiate operations in the 2000-2001 season. All four companies are members of IAATO. The *Rotterdam* (HALW) which sailed through Peninsula area waters during the 1999-2000 season is not included in the figures since the ship cruised only without landing any passengers.

[96] It is likely that U.S.-based small vessel operators will continue to enter the market as IAATO members with expeditions to the Peninsula area. However, this may occur as more IAATO Associate Members move to Provisional and Full Member status. For example, for the 2000-01 season, IAATO identified two new operators. Both were previously Associate Members and had booked tourists on other IAATO-member expeditions and vessels. Both operators plan to continue to charter on other IAATO-member's vessels but they are now Provisional IAATO Members and are the recognized organizers for their expeditions for purposes of EPA's Interim Final Rule at 40 CFR Part 8.

[97] Regarding large cruise vessels, the IAATO Bylaws include a provision that members not carry more than 400 passengers per trip. IAATO is currently considering membership options for large vessel operators that would bind them to the operational provisions of IAATO members (IAATO SATCM/IP 2000).

[98] E.g., operators other than those moving from IAATO Associate Member to Provisional/Full Members status.

borne passengers,[99] the number of yachts carrying passengers to Antarctica is expected to increase in the out-years, particularly in support of land-based adventure tours in the Peninsula area.[100]

Substantial out-year growth in Antarctic tourism could be related to an increase in the number of large vessel expeditions. According to IAATO, large cruise vessels have not regularly visited Antarctica since the 1970s when the *Regina Prima, Cabo San Roque* and *Cabo San Vincente* made a number of voyages, each with more than 800 passengers aboard. In 1992-93, the *Sagafjord* included a cruise-only visit to the South Shetlands as part of an around the world voyage, and in 1994-95, the *Europa* sailed to Antarctica with 841 passengers (IAATO XXIII ATCM 1999). The 1999-2000 season is the first since these that several large vessels have cruised Antarctic waters. During the 1999-2000 season, the *Marco Polo* (which regularly operates in Antarctica) was joined by the World Cruise Company's *Ocean Explorer I* and *Aegean I* and HALW's *Rotterdam*. The *Marco Polo* conducted four cruises and carried about 500 passengers with 300 crew/staff per voyage. The *Ocean Explorer I* (similar in size to the *Marco Polo*) conducted two cruises and carried an average 425 passengers with 335 crew/staff per voyage, and the *Aegean I* (slightly smaller sized) conducted two cruises and carried an average 225 passengers with 290 crew/staff per voyage.[101] The *Rotterdam* carried a record of nearly 1000 passengers with crew/staff of 600 on its single voyage (Orient Lines IEE 1999; World Cruise Co. IEE 1999; ANAN-11/03 Dec. 22, 1999; IAATO ATCM XXIII 1999; and ANAN-17/07 Mar. 15, 2000).

U.S.-based Orient Lines has operated the *Marco Polo* in both the Peninsula and Ross Sea areas of Antarctica since 1992-93. However, beginning with the 2000-2001 season, Orient Lines has eliminated its semi-circumnavigation cruise from the Peninsula area to the Ross Sea and replaced this with an additional cruise to the Peninsula area for a total of six voyages to the Peninsula area.[102] The

[99] During the 1999-2000 season, yachts were estimated to carry about 235, or 1.6%, of the total 14,762 ship-borne passengers.(IAATO SATCM/IP 2000).

[100] The number of yachts visiting Antarctica has increased steadily since the early 1970s with yachts increasingly taking fare-paying passengers; many commercial yacht operators are not IAATO members. IAATO has made an effort to reach out to yacht owners and operators and to encourage IAATO membership. Two operators are IAATO members and several others are now attending IAATO's annual operators' meeting (United Kingdom ATCM/IP1 1998 and IAATO XXIII ATCM 1999).

[101] The *Ocean Explorer I* anticipated carrying about 1,100 passengers on each of its two voyages but carried about 850 total passengers; the *Aegean I* anticipated carrying about 1,000 passengers on each of its two voyages but carried about 450 total passengers.

[102] U.S.-based Quark Expeditions (*Kapitan Khlebnikov),* New Zealand-based Heritage Expeditions (*Akademik Shokalskiy*) and the Canadian-based Marine Expeditions (*Lyubov Orlova*) are expedted to continue to operate in the Ross Sea area. The German-based operator, Hapag-Lloyd (*Bremen*) has operated in the Ross Sea area during previous seasons and plans to operate in this area again during the 2000-2001 season, and a new operator, Southern Australian Shipping Company, plans to begin expeditions to the Ross Sea regions during the 2000-2001 season.

planned itineraries will be similar to previous Peninsula area cruises (see Section 3.9.1) (Orient Lines IEE 2000).[103] As a result of this shift, *Marco Polo* passengers will no longer visit and land in the Ross Sea area, but an additional load of about 500 passengers will be landed at certain Peninsula area sites.

U.S.-based HALW does not plan to operate the *Rotterdam* or any of its other cruise vessels in Antarctica during the 2000-2001 season (ANAN-19/02 Apr. 12, 2000). However, during the 2001-2002 season, HALW does plan to include cruising in Antarctic waters as part of the two world cruises of the *Ryndam*. Each cruise would carry up to 1,200 passengers and 560 crew. The plans for the Antarctic legs of these world cruises are the same as those of the *Rotterdam's* 1999-2000 season expedition, a 72-hour cruise in the Peninsula area with no landings (see Section 3.9.2) (HALW IEE 2000).

In future years, the World Cruise Company had planned to conduct one annual tourist expedition to Antarctica with a single 500-passenger vessel. However, the company has entered bankruptcy and its status with regard to future Antarctic expeditions is uncertain. Without this company's operations, the only large vessel operating in the Antarctic Peninsula area during the 2000-2001 season will be the *Marco Polo* (World Cruise Co. IEE 1999; ANAN-23/03 Jun. 7, 2000; and Biggs Jun. 16, 2000).

In the out-years, it is possible that at least one additional U.S.-based large vessel operator could enter the Antarctic tourism market.[104] [105]

During the 1999-2000 season, sister Canadian operators World Cruise Company and Marine Expeditions implemented a unique passenger transfer operation. The companies coordinated logistics for 10 voyages involving five vessels and several thousand passengers over a two-week period in order to move tourists to the Peninsula area and subsequently exchange passengers between the large and small vessels while in the Peninsula area (ANAN-17/07 Mar. 15, 2000 and Biggs Jun. 16, 2000). Two elements of this operation bear consideration for out-year tourism projections. First, the new airport at Ushuaia can now handle the number of larger aircraft and flights that makes it possible to bring the numbers of passengers into Ushuaia that are needed to economically fill several large tour

[103] Three of the four planned landing sites remain in the top eight ranked sites for both the number of landings and the number of annual visitors (see Section 3.13.2).

[104] U.S.-based Crystal Cruises has discussed with EPA its plan to include cruising in Antarctic waters as part of its 2001-02 world cruise. As tentatively planned, this large-vessel expedition would be similar to HALW's and would include cruising only without passenger landings.

[105] Norwegian Cruise Lines, the parent of Orient Lines which operates the *Marco Polo*, is the subject of a take-over bid by the U.S.-based Carnival Cruise Lines, the world's largest cruise ship owner. The large world-wide Swiss travel group, Kuoni Travel Holding Limited of Zurich, has purchased the parent company of the U.S.-based Clipper Cruise Line (ANAN-14/06 Feb. 2, 2000).

vessels. Further, a passenger transfer operation in the Peninsula area, such as the one by World Cruise Company and Marine Expeditions, provides the opportunity to transport larger numbers of passengers across the Drake Passage to several smaller vessels already in the area. This represents savings in terms of both fuel costs[106] and time[107] and thus provides opportunity for a larger number of passengers to economically tour the various Peninsula area landing sites.[108]

Although no U.S.-based operators have indicated plans to participate in similar operations, it is conceivable that such operations could be economically viable to U.S. operators in the future.

With regard to small vessel operators, the U.S.-based IAATO Provisional member, Expeditions, Inc., had intended to operate tours in the Peninsula area during the 1999-2000 season but did not.[109] It is likely that Expeditions, Inc., will operate Peninsula area tours as an IAATO Provisional or Full member in the future. U.S.-based Cheesemans' Ecology Safaries joined IAATO as a Provisional member in 2000. The company has previously booked tours through Canadian-based Marine Expeditions but now plans to organize expeditions to Antarctica beginning with the 2000-2001 season (IAATO IEE 2000).

Karlsen Shipping of Halifax, Nova Scotia, Canada, plans to initiate Peninsula area tourism with the *Polar Star*, with about 100 passengers and 40 crew/staff, beginning with the 200-2001 season. Karlsen Shipping may operate the Antarctic tours through a yet unnamed Spitzbergen-based tour group (ANAN-22/01 May 24, 2000). Given the ship's size, the operator should be eligible for IAATO membership.

The Southern Australian Shipping Company (SASCO) plans to initiate Ross Sea area tourism with the *Southern Australis*, with 100 passengers and 60 crew/staff, beginning with the 2000-2001 season. SASCO is also eligible for IAATO membership (ANAN-5/01 Sep. 29, 1999 and ANAN-10/03 Dec. 8, 1999).

McIntyre Marine (Australia) has operated in Antarctica since the mid-1990s and now plans to expand its operations in conjunction with its sister Australian organization, Ocean Frontiers. Vessels to be operated include the *Sir Hubert Hilkins* and five yachts which are intended to support adventure tours beginning in 2002-2003. The *Sir Hubert Hilkins* has a 32-passenger capacity and

[106] IAATO reported that future oil prices could effect a number of ships and trips due to the great distances ships must travel to reposition to Antarctica (Landau Sep. 25, 1999).

[107] E.g., the number of days required for the smaller vessels to round-trip the Drake Passage.

[108] This process may also provide some degree of comfort for the passengers since crossing the Drake Passage in a larger vessel could allow for a smoother voyage.

[109] Expeditions, Inc., became an Associate member of IAATO when it was unable to complete charter arrangements for a vessel for its planned 1999-2000 expeditions (Landau Jun. 3, 2000).

carries a single helicopter; long-term plans include operation of a small submarine from the vessel. The companies' planned expedition activities include: educational programs, film expeditions, scientific research, environmental monitoring and private ventures (ANAN -21/01 May 10, 2000). Currently, neither company is an IAATO member.

An Australian ship builder, Oceanfast, plans to begin construction on the "Norman Expedition Yacht" series during 2000 with commissioning of the first yacht, *Aussie Rules*, expected in 2002. Expeditions to Antarctic waters are planned but details are not yet available about the expeditions' operator(s), the types of activities, or the number of yachts to be produced. The *Aussie Rules* will accommodate up to 12 passengers with 14 crew. The yacht will carry a boat for offloading and other water craft including tenders and submersibles; a decompression chamber will also be onboard (ANAN-22/04 May 24, 2000).

A slow increase is projected for the out-years for the small vessel operators. The number of Full and Provisional IAATO members has increased from 7 to 19, an increase of about one to two members per year since its founding in 1991. Since 1998, four of the new IAATO members have been U.S.-based. This increasing trend in the number of small vessel operators may continue as long as there is growth potential for the Antarctic niche of the growing overall world cruise market. Alternately, rising costs (especially fuel) and a stabilization of the passenger base to about 10,000 per year would likely limit the number of new small vessel operators entering the market. The number of small vessel operators could even decrease if the present operators become more economically competitive and secured 90-100% of the vessel capacity or if large vessels, such as the *Marco Polo*, capture more of the market.

Yacht expeditions in Antarctica are projected to increase in the out-years. Though typically carrying fewer passengers than the small vessels, [110] yachts are increasingly being used to support adventure tourism in both the Peninsula and Ross Sea areas. Currently, there are no U.S.-based yacht operators, but this is not precluded if market demand supports increases in yacht-based tourism.

The typical activities associated with small vessel Antarctic tourism are expected to continue. In addition, other somewhat unique small vessel and yacht-based activities are also likely to continue. IAATO-member Aurora Expeditions (Australia) will probably continue to offer SCUBA diving and kayaking, and the U.S.-based operator, Lindblad Special Expeditions, also plans to offer SCUBA diving and kayaking beginning with the 2000-2001 season (Biggs Jul. 19 2000). Because of the special equipment and preparations required for these activities and the limited interest and participation, it is not anticipated that other operators will offer these activities in the near future. Yacht-based surfing expeditions may continue, but since good surfing conditions were found at only

[110] IAATO-member, Pelagic Expeditions, operates the six-passenger *S/Y Pelagic*. For the 1999-2000 season, an estimated 16 yachts were anticipated to carry an average of nine passengers on 20 voyages (IAATO IEE 1999)

two locations in the Peninsula area, the number of participants in this activity will likely remain very limited.

3.14.3. Continental and Other Adventure Tourism

In addition to the usual Antarctic continental touring, adventure and trekking expeditions and activities, the number of participants in certain adventure activities is likely to increase in the out-years along with the types of activities offered.

Mountaineering activity in Antarctica has increased particularly over the past two seasons.[111] Climbers may be recognizing the potential for mountaineering in the Antarctic in both the continental and Peninsula areas, particularly as Internet publicity associated with reconnaissance expeditions generates interest in the range of opportunities commercially available. Mountaineering reconnaissance supported by ANI (including one small group of U.S. citizens) has been underway in the Queen Maud Land and Peninsula areas (ANAN-19/06 Apr. 12, 2000; ANAN-17/02 Mar. 15, 2000; ANAN-16/01 Mar. 1, 2000; ANAN-19/09 Apr. 12, 2000; and ANAN-21/09 May 10, 2000).[112] Adventure Consultants (Australia), has used ANI for its continental climbing expeditions for the past 10 seasons. For the 2000-2001 season, the company plans to offer mountaineering and/or skiing trips to the Peninsula area via ship, with the program's support ship stationed offshore of climbing areas to act as a mobile base camp for those in the field (ANPN-1/2 Aug. 4, 1999). During the 1999-2000 season, High Jinx (Australia) operated a climbing expedition in the Peninsula area, and plans to market two yacht-based expeditions to the Peninsula area in the 2000-2001 season aimed at mountaineering, skiing, and general sightseeing (ANAN-21/09 May 10, 2000).[113] Mountaineering/skiing expeditions generally involve 10 or less participants, thus it is most likely that yachts will be the Peninsula area support vessel for these expeditions.

Heritage Expeditions (New Zealand) is exploring plans to use all-terrain vehicles (ATVs) for ship-shore passenger transport in the Ross Sea area to improve opportunities for delivering tourists to such locations as McMurdo Station, Scott Base, and Capes Royds and Evans, and to land passengers to within walking distance of the Lower Taylor Valley, one of the Dry Valleys (ANAN-

[111] During the 1999-2000 season, the number of ascents of Vinson Massif were expected to pass 500. The summit was first reached on December 18, 1966, and since then, over 80% of the climbs have been undertaken in the past decade. From about 1985-1990, between 5 and 20 people made the ascent each year, but in the 1990s, this rose to 40-60 ascents per year. Of the estimated 485 individual ascents, all but about 35 reached Antarctica and were supported by ANI (ANAN-19/06 Apr. 12, 2000).

[112] Activities occured on King George Island, adjacent to Culverville Island, Paradise Bay area, Neko Harbor, and near Port Lockroy on Weinke Island. From: Mountain Zone at: http://www.mountainzone.com/ski/2000/penisula/dispatches.html.

[113] High Jinx has affiliated with several of the yachts operating in the Peninsula area for a number of years. (ANAN-21/09 May 10, 2000) .

17/04 Mar. 15, 2000).[114] Currently, all nongovernmental visits to the Dry Valleys are made using helicopters from the *Kapitan Khlebnikov*. The U.S.-based operators with Ross Sea area tours, have not indicated their interest or intent to similarly use ATVs, but this could be possible in the future. If ATVs prove to be practical and cost-effective for transporting tourists to the Dry Valleys, this could potentially increase the number of visitors to this area.

Polar Sky Diving Ltd. (PSD), was formed in the United Kingdom in 1999 as a sister operation to Adventure Network International. PSD plans to offer sky diving opportunities at both the South and North Geographic Poles. For the Antarctic operations, air transportation and logistics will be provided by ANI.[115] Although there was insufficient interest for the 1999-2000 season, the company plans to continue to offer such opportunities to select groups of experienced skydivers (ANPN-1/1 Aug. 4, 1999 and ANAN-11/14 Dec. 22, 1999).

McIntyre Marine (Australia) will likely continue to offer the opportunity to winter over at its small overwintering facility at Commonwealth Bay, George V Land, and it is conceivable that individuals may also attempt their own wintering over expeditions (e.g., Australian Trevor Robertson at Port Lockroy). However, the number of wintering over participants has been extremely limited and this is not expected to change in the out-years.

With regard to one-time expeditions by U.S.-based operators, Base Camp Promotions is organizing a 2000-2001 expedition for a U.S./Norwegian two-woman team to trek across the continent, the first such journey by an all-woman team (Base Camp Promotions IEE 2000). This is the second U.S.-based one-time expedition during the past three seasons.[116] [117] One-time expeditions by U.S.-based operators are likely to continue to occur occasionally.[118]

[114] ATVs have been used at New Zealand's Scott Base since 1998. Other national programs have used them with mixed success. New Zealand requires its tour operators to comply with the Dry Valleys Code of Conduct which requires that ground vehicles be restricted to ice and snow areas (ANAN-17/04 Mar. 15, 2000).

[115] ANI provided operational support for a previous sky diving expedition (see Section 3.10).

[116] See: White Mountain Films, Section 3.12.2.

[117] This covers the time period that EPA's Interim Final Rule at 40 CFR Part 8 has been in effect; e.g., the 1997-98, 1998-99, 1999-2000, and 2000-2001 austral summer seasons.

[118] UK-based ANI is the operator for nearly all of the trekking expeditions, including those with U.S. citizens, and, because of the equipment and logistics involved, ANI is expected to continue to serve as the operator for most or all of these expeditions.

3.14.4. Overflights and Other Air Operations

Qantas Airways Ltd. in conjunction with Croyden Travel Centre (Australia) has offered overflights of the continent every year since 1994-1995. Six flights were offered in 1994-1995 with this increasing to nine in 1995-1996; nine flights were undertaken in 1999-2000. The number of passengers has increased by about 500 between the 1995-1996 and 1999-2000 seasons, with passenger loads increasing from about 330 per flight in the second season to nearly 390 per flight in 1999-2000. Through the 1999-2000 season, 52 flights have carried about 17,500 passengers. This level of activity is expected to continue by this operator in this area (Australia XX ATCM/INF 34 1996; ANAN-7/04 Oct. 27, 1999; and ANAN-16/05 Mar. 1, 2000).

Over the past decade, DAP[119] has carried an estimated 150 tourists on available seats on its national program supply flights from Chile to the Presidente Eduardo Frei station on King George Island. DAP has indicated it is considering expanding its small party operations in the Peninsula area, possibly in conjunction with yacht-based excursions, and potentially to Patriot Hills (where the Chilean national program has been operating in recent years) in conjunction with continental touring, and adventure and trekking expeditions (ANAN-17/03 Mar. 15, 2000).[120] However, unless 'scheduled' flights can be established, DAP will likely carry only a limited number of passengers annually under its proposed expanded flight operations.

An Australian businessman, in conjunction with McIntyre Marine (Australian), has expressed interest in establishing a blue ice runway facility and base camp on Rennick Glacier in Victoria Land. Reconnaissance and field surveys are planned for coastal regions of the George V. Oates and northern Victoria Lands areas during the 2000-01 season (ANAN-21/01 May 10, 2000).[121] If successful, these air operations could increase adventure tourism in this continental area.

Currently, there are no U.S.-based airline operators in Antarctica, nor are any projected to enter the market.

[119] The Chilean regional air line, La Linea Aerea de la Patagonia.

[120] Weather is the primary factor for flight operations to both the Peninsula area and the continent impacting both take off and landings. Should air navigation systems improve to allow take offs and landings to proceed in what is now unacceptable weather conditions, more reliable flight schedule service could be developed (ANAN-17/03 Mar. 15, 2000).

[121] According to the proceedings from a series of workshops on the use of blue ice runways in Antarctica, East Antarctica is a prime candidate, not only because of commercial tourism potential, but also as an operational support hub for several different nations' research stations in that region. Specifically, an Australian businessman has publically expressed interest in a runway and base camp (ANAN-21/02 May 10, 2000).

3.14.5. Nongovernmental Research and Greenpeace International

The U.S.-based Oceanites completed its sixth season of the Site Inventory Project with continued collection of baseline data at tourist landing sites in the Peninsula area (see Section 3.11). Out-year projections are that Oceanites will continue its tourism-related research in the Peninsula area as long as it continues to receive private and/or government funding support.

As discussed in Section 3.12.1, Greenpeace International continued its nongovernmental expeditions during the 1999-2000 season by harassing whaling and fishing operations in the Southern Ocean. Greenpeace has indicated its plans to continue these expeditions as long as whaling and illegal fishing occur in the Southern Ocean.

During the 1999-2000 season, the Australian Oceanic Research Foundation undertook initial field work to examine the feasibility of recovering three anchors lost overboard from the historic expedition vessel, *Aurora*,[122] and the Australian Mawson's Hut Foundation was working on plans to complete restoration work on Sir Douglas Mawson's 1911-14 expedition hut at Cape Denison (ANAN-21/02 May 10, 2000 and ANAN-21/05 May 10, 2000). It is conceivable that these projects, and nongovernmental projects similar to them, will occur in the out-years, though none are anticipated as U.S.-based nongovernmental expeditions.

3.14.6. Summary of Out-Year Projections for U.S.-Based Operators

Antarctic tourism is forecasted to increase by about 11% over the next five years with most expeditions to the Peninsula area. These expeditions are expected to continue to be conducted primarily by IAATO-member operators aboard small vessels with 40% to 50% of these being U.S. operators. Although the number of IAATO-member operators is not forecasted to increase over the next five years, including U.S.-based IAATO-member operators, significant tourism increases could occur if additional new small vessel operators enter the market and offer multiple expeditions annually, or if current IAATO-member operators increase their annual operations.

Any significant increase in tourism in the out-years, particularly in the Peninsula area, will likely be due to large vessels entering the market or to increases by a current operator in its annual operations. One new U.S.-based large vessel operator has expressed interest in the Antarctic market; the expedition would likely involve cruising only with no passenger landings.[123] U.S.-based Orient Lines is expected to continue its annual Antarctic program. The company plans for the *Marco Polo* include elimination of its Peninsula area to Ross Sea area semi-circumnavigation with the addition of one Peninsula area cruise for a total of six Peninsula area voyages. To date, U.S.-based HALW's has

[122] The *Aurora* was lost in 1912 during Mawson's Australasian Antarctic Expedition.

[123] Crystal Cruises has had only preliminary discussions with EPA about its possible plans to enter the Antarctic cruise market.

not established an annual schedule for operation of its very large vessels in Antarctica; the *Rotterdam* operated in 1999-2000, and two cruises are planned for the *Ryndam* in 2001-2002.

With regard to activities and vessel operations, to date, the HALW large vessel voyages involve cruising only with no passenger landings. However, the company had originally proposed using the ship's tenders to put passengers ashore in the Peninsula area and it is possible that the company could plan for this activity in the future. Regarding other large/small vessel operations, the feasibility of transferring passengers between a large vessel and several small vessels already in the Peninsula area was demonstrated during the 1999-2000 season. Such an operation provides a savings of time and fuel costs for the small vessels, and also provides the opportunity for more passengers to tour the various Peninsula area landing sites. It is possible that U.S.-based operators could undertake this type of operation in the out-years.

Yachts expeditions in both the Peninsula and Ross Sea areas are projected to increase in the out-years, particularly in support of land-based adventure expeditions. Though none are anticipated, it is possible that U.S.-based yacht operators could enter the Antarctic tourism market.

Continental touring, adventure and trekking expeditions are expected to continue to be operated by ANI out of its Patriot Hills base camp. If the proposal to establish a new blue ice runway facility and base camp on Rennick Glacier in Victoria Land is realized, this could increase adventure tourism in this continental area. The out-year projections do not foresee entry of a U.S.-based operator into the continental sector of the Antarctic tourism market.

Currently, there are no U.S.-based airline operators in Antarctica, nor are any projected to enter the market. This out-year projection is based on U.S.-operator access to departure terminals, the limited market associated with either Peninsula or continental overflights, and the difficulties associated with siting and operating a runway and base camp in either the Peninsula or continental areas.

Finally, U.S.-based Oceanites is expected to continue its tourism-related research in the Peninsula area as long as it continues to receive private and/or government funding support.